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MYXO-SARCOMA OF THE OPTIC NERVE WITH HYALIN DEGENERATION.

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(*With three illustrations.*)

IF we limit the designation "primary tumors of the optic nerve" to those tumors which originate within the optic-nerve sheath, there are recorded some thirty-seven cases, of which but a small number are reported in full. A large proportion of these, although appearing in the records with a varying nomenclature, seem to belong to the *sarcomata*, and a considerable number of them have shown a marked degree of *myxomatous* degeneration, or have been distinctly *myxo*-sarcomatous in structure.

The tumor which it is the purpose of this paper to record, though closely resembling others from the same situation fully described, presents some structural features worthy of special notice.

Carrie L. A., age twelve. First examined the patient, August 14, 1883. She is a strong, healthy, well-nourished child, with a good family history. Always enjoys good health and is accustomed to hard work. Presents herself with an *exophthalmos* of the left eyeball, which protrudes 13‴, at times pressing through the palpebral fissure and appearing to be entirely without the orbital cavity. The lower eyelid constantly everted is thickened

and very much swollen, while coaptation of the lids is impossible. The conjunctiva is hypertrophied, red, and œdematous, and there is more or less continuous discharge of lachrymal secretion, containing shreds of thick *mucus*. The cornea is hazy, but not at all anæsthetic. The pupil moderately dilated responds very slightly to light. Dilatation is increased after instillation of atropine. The eyeball has considerable mobility in all directions, except downward. On palpation, a tumor is felt behind the globe, apparently occupying the entire cavity of the orbit, larger in the external and inferior quadrants. The eyeball is flattened from before backward, and is displaced upward, inward, and forward. The tumor is distinctly felt, gives the impression of being composed of numerous small bodies, about the size of peas, and has a soft, elastic feel. Pressure does not decrease the size of the tumor, and there is no pulsation or bruit.

The ophthalmoscopic examination shows a pink reflex ; retinal vessels very much diminished in size, and in the region of the macula, two or three small patches of choroidal atrophy, nearly as large as the head of a pin, direct method, with disk, very white and decreased in size.

The vision of R E = $\frac{20}{200}$. L E, no perception of light. The patient has a rapid pulse, about 120, but as no heart lesion is discovered, this is ascribed to excitement.

Previous History.—When a child six years old, her mother first noticed a prominence of the left eye, which has gradually increased until the present time. Six months after the first appearance of this enlargement, it was discovered that the eye was sightless.

The patient never had any pain or annoyance from her eye until one year ago (that is, five years after the trouble commenced), since which time she has been at times affected with a sense of fulness, and occasionally with pains about the eye and corresponding temple. These symptoms and more or less dizziness are aggravated on stooping. The patient was examined in consultation at the Manhattan Eye and Ear Hospital, and although there was some difference of opinion, the diagnosis, *orbital tumor of the optic nerve*, was made, and enucleation was advised, the majority believing the tumor malignant.

September 2, 1883.—The patient was anæsthetized and the operation commenced. The intention was to enucleate the tumor, without removing the eyeball, if possible. After the initiatory

steps had been performed, the very considerable size of the tumor compelled us to abandon the idea and proceed to enucleate the eyeball and tumor. The dissection of the conjunctiva was continued around the corneal margin. The fan-like attachments of the muscles exposed were 3‴ or 4‴ in breadth, and very much hypertrophied, and were easily cut without using a hook. The tumor, then exposed to view, behind a large quantity of orbital fat (which was probably the cause of the feeling of the small, pea-like bodies discovered on palpation), was solid, oblong, and almost entirely filled the orbit. For this reason it was difficult to make the dissection, and the external canthus was slit to make more room.

During the operation the nerve sheath, which was distended with fluid clear up to its junction with the globe, was punctured, and a yellowish serous fluid escaped.

The dissection was continued with the finger and the handle of a scalpel, until it was discovered that the tumor extended into the foramen of the optic nerve. Desiring to remove the entire tumor, a strong ligature was passed through it for the purpose of drawing it forward, so that, if possible, the section might be made behind it.

It seemed that the sheath, which enclosed the tumor, was attached to the optic foramen. An effort was made to cut it before severing the tumor, and then to drag the tumor forward and cut it. This was accomplished, as the surface of the tumor protruded nearly 1‴ from within the sheath after its excision. The result, however, was probably a recession of the arteries, as there was a hemorrhage after the operation, which at times would be considerable, and at other times only oozing, resisting for eight hours all measures adopted for its control. The patient vomited very frequently, and each effort at vomiting caused renewed bleeding, the vomited matter, for the most part, being blood, which had passed down through the floor of the orbit. Five hours after the hemorrhage had entirely ceased, and while the nurse was sleeping, there was a second hemorrhage, which almost resulted fatally. The examination of the orbit disclosed that its floor, thin and eroded from pressure, had broken through during the operation. The optic foramen seemed to be enlarged to such an extent that the point of the index finger could be introduced. It appeared free from tumor substance, although it was thought that some portion of the tumor may have been left behind. The wound healed kindly, but slowly, without much purulent discharge, and the tissues shrunk gradually back into the orbital cavity. For a num-

ber of weeks there remained an opening into the back of the orbit, which discharged a small quantity of thick *muco-pus*. Forty-eight days after the enucleation, this opening has healed. The patient is in good health. The orbital tissues present the usual amount of shrinkage, and the disease shows no tendency to recurrence.

May 1, 1885.—The patient is now nearly fourteen years old, and has enjoyed good health since the operation, September 2, 1883. She has not been troubled by any pain in the region of the operated eye, and has worn a glass eye for about a year.

The orbital tissues are slightly more shrunken than at the last examination, and there is no tumefaction in any part of the orbital cavity, nor any thing which would appear to indicate a probability of recurrence.

The tumor was examined microscopically by Dr. Prudden whose report follows.

FIG. 1.

The tumor, after hardening in Müller's fluid and alcohol, presents the following macroscopical appearances:

It is irregularly ovoidal in shape, being somewhat flattened on one side. It is about 35 *mm.* long and about 20 *mm.* in the largest diameter. It is slightly nodular, and is completely invested by a dense, thick, connective-tissue sheath, which is continuous anteriorly with the sclerotic, and which is evidently the distended external optic-nerve sheath. This sheath is loosely attached to the tumor tissue within. From the anterior and more tapering end of the tumor, the optic nerve emerges, being somewhat narrower in diameter than normal and slightly flattened, and passing forward for about 1 *cm.* in a curved direction, enters the globe.

A longitudinal section through the middle of the tumor and the globe, presents the appearances seen in fig. 1.

Continuous with the optic nerve anteriorly, extending completely through the tumor, and lying somewhat to one side of its axis, is a longitudinally striated mass, about 8 *mm.* thick, somewhat denser than the remainder of the tumor, and for the most part sharply outlined against the rest of the tissue. This is evidently the enlarged optic nerve.

The tumor substance which surrounds the thickened optic nerve and occupies the space between it and the external sheath, is for the most part translucent, and appears to be made up of irregularly arranged masses and bands of soft tissue.

Microscopical examination of sections of this portion of the tumor surrounding the optic nerve, shows that it consists, in the main, of irregular larger and smaller masses and intricately interlacing bands of closely packed cells, separated by narrow and broad bands of dense fibrillar connective tissue, the whole moderately vascular. Into many of the cell-masses, connective-tissue fibres and fibrillæ penetrate; delicate elastic fibres are also of frequent occurrence. In some places, notably immediately around the thickened optic nerve, the fibrillar connective tissue predominates, but in most parts the cell-masses make up most of the substance. In some parts of the tumor larger and smaller islets of distinctly myxomatous tissue are present, while in others the cell-masses appear to be simply œdematous, and thus present an appearance somewhat simulating that of mucous tissue.

Scattered everywhere among the cells of the tumor, in some places sparsely, in others in great numbers, are seen sections of very irregular, larger and smaller translucent, strongly refractile bodies with rounded contours, which appear to be in connection with the cells composing the above-described cell-masses, or with the smaller blood-vessels.

These translucent bodies have the general appearance of amyloid, but they are not stained in the manner characteristic of that substance by iodine or by methyl violet. They are, on the contray, very readily stained by eosin, fuchsin, —particularly the acid fuchsin,—methyl-green, and by hematoxylin, and retain these colors very tenaciously in the

presence of strong acetic acid, alcohol, and caustic potash (30 per cent.). When unstained they are but slowly affected by strong aqua ammoniæ and 33 per cent. caustic-potash solution. They are not very readily stained by carmine. Their general appearances and the above series of reactions would indicate that the strongly refractile bodies scattered through the tumor tissue belong to the material which results from the so-called hyalin degeneration, as described by Recklinghausen.[1]

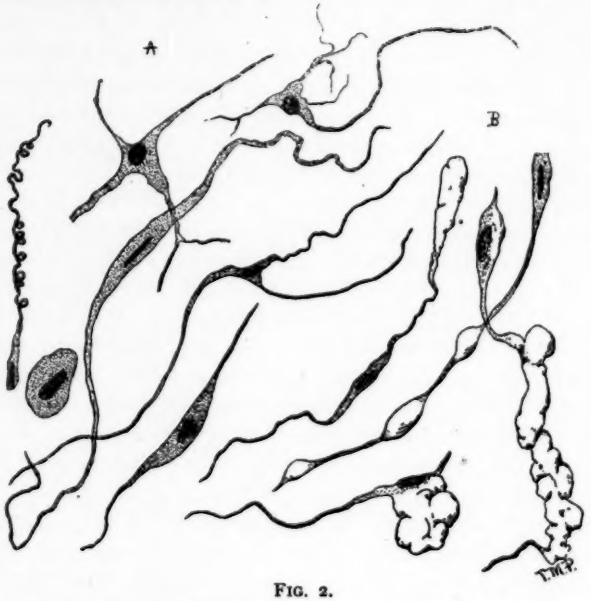


FIG. 2.

A. Cells from teased tumor. B. Degenerated cells from the same.

The shape of the cells composing the main part of the tumor, as well as the mode of origin of the above-described hyalin bodies, is best seen in bits of the tissue stained and carefully teased.

Some of the varied shapes of the cells prepared in this way are represented in fig. 2, A. The most abundant

[1] Recklinghausen in Billroth & Lücke's Deutsche Chirurgie, Lief. 2 and 3, page 404.

form is that of exceedingly long and slender spindles with either spheroidal or elongated nuclei. Some of these cells are so long and slender that they might readily be mistaken for simple fibres; careful scrutiny alone revealing the small nuclei. There are other fusiform cells which are broader and shorter, the bodies tapering to a point at a short distance from the nucleus. Branching cells with several processes, some long and fibre-like, others short and dividing and tapering, are quite numerous, as are also fusiform cells whose fibre-like ends are curled into close irregular spirals. Finally, larger and smaller spheroidal cells are present, but vary considerably in number in different parts of the tumor.

The teased preparations show, furthermore, in the most evident manner, the mode of origin of the hyalin material. This is formed, as shown in fig. 2, B., by an irregular degeneration of parts of the tumor cells. These are sometimes to a slight extent, sometimes almost completely, converted into the hyalin material, and are to a corresponding degree distorted and deformed. In some cases the whole thickness of the cell is not converted into the hyalin material, but the latter appears in the form of irregular shining masses or droplets completely enclosed by the cell protoplasm.

In the separated cells as well as in sections, the above-mentioned micro-chemical reactions were obtained.

Similar translucent masses have been described in tumors of the optic nerve by several observers. Structures which, judging from his drawings, were similar to these degenerated cells, were described by Perls,[1] as occurring in large numbers in a tumor of the optic nerve which he regarded as a true neuroma. The cells were considered to be ganglion cells; and the translucent shining material myelin in the process of formation about the fibre-like branches of the cells. The probability that this conception of the nature of the cells and translucent shining material by Perls was an error, has been pointed out by Vossius and Lebert,[2] who have described the same appearance in similar tumors of

[1] Perls: *Arch. für. Ophthal.*, Bd. xix., Abth 2, p. 287.
[2] Vossius: *ibid.*, Bd. xxviii., Abth. 3, p. 33.

the optic nerve, and who also had the opportunity of examining the original tumor of Perls. Lebert examined the translucent material in the fresh condition, and found that it did not stain black on treatment with osmic acid. If, as seems probable, this criticism is correct, a true neuroma of the optic nerve seems never to have been described.

Dr. Johnson's tumor was not received in the fresh condition, so that the usual micro-chemical reactions for fresh nerve tissue could not be employed; but a series of the tests applicable to preserved nerve tissue were made, all of which failed to give any indication of nerve elements in the tumor tissue proper, outside of the limits of the optic nerve. Among the tests above alluded to were the prolonged staining with dilute gold-chloride solution and reduction in caustic-soda solution; the use of the chloride of palladium and subsequent staining with carmine.

As the hyalin material retains the color imparted by acid fuchsin, it was not surprising that the acid fuchsin staining of Weigert should give a very excellent staining of the degenerated portions. It was, however, a surprise to find that the hematoxylin method of staining nerve tissue as described by Weigert gave most exquisite pictures of the topography of the degeneration; the hyalin material being stained bluish black, just as the myelin is, in successful preparations of the nerve tissue. This possibility of a similarity of reaction in hyalin material and in myelin must, therefore, evidently be borne in mind, if the possibility of error would be avoided in using either the hematoxylin or the acid fuchsin method of Weigert for staining nerve tissue.

The microscopical examination of the enlarged portion of the optic nerve, which passes through the tumor, shows that there is a considerable increase of the connective-tissue septa which divide the nerve into bundles, and also a very marked growth between the individual nerve fibres, apparently from the neuroglia, of cells similar to those composing the more characteristic parts of the tumor proper. The same hyalin degeneration is seen also in the new cells of the optic nerve, but it is most abundant in the periphery of

the bundles along the sides of the connective-tissue partitions of the nerve. The nerve fibres are in part normal, but, especially in the middle and posterior portions, they are to a considerable extent atrophied.

That part of the optic nerve which lies between the tumor and the globe shows simply a marked increase of the interstitial fibrillar connective-tissue, with corresponding atrophy of the nerve fibres, with here and there small masses of hyalin material, but none of the characteristic tumor cells.

In the tumor tissue proper there is hyalin degeneration of the walls or about the walls, especially of the smaller blood-vessels, as represented in fig. 3.

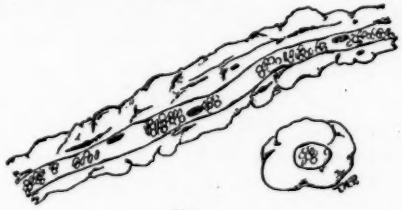


FIG. 3.
Capillary blood-vessels with hyalin degeneration of the walls.

Microscopical examination of the enucleated eye shows considerable increase of the connective tissue of the optic nerve, with corresponding atrophy of the nerve fibres and thickening of the walls of the retinal artery. There are patches of œdema of the retina, particularly of the outer layers. The choroidal blood-vessels are generally and deeply congested, and in the sections made there was found one small patch of atrophy of the choroid near the optic papilla. The eye appeared otherwise normal, but the nerve elements of the inner layers of the retina were not well preserved, so that their condition could not be determined.

The tumor apparently originated in the neuroglia of the optic nerve, or in the connective tissue of the inner sheath. Its growth was largely in the space between the external and internal nerve sheaths, and only to a moderate degree in the interstices of the nerve itself.

Recklinghausen reported hyalin degeneration of the blood-

vessels in one of the earlier cases. The translucent, shiny masses, as above stated, have been described and figured by several observers. Vossius conjectures that they might be of a "hyalin-colloid" nature; but otherwise the nature of the material has been but indefinitely characterized.

It will thus be seen, if the interpretation placed by the writer upon the character of the degenerated portions of these tumors be correct, that hyalin degeneration, which is of occasional occurrence in a great variety of tumors, is quite frequent in the myxo-sarcomata of the optic nerve, and may give rise, here as elsewhere, to very peculiar and oftentimes puzzling microscopical appearances.

It is not necessary for the purposes of the present paper to make a detailed reference to the bibliography of tumors of the optic nerve. Twenty-seven cases were collected by Willemer, *Archiv für Ophthal.*, Bd. xxv., Abth. 1, p. 161, 1879. This number was increased to thirty-six by Vossius, *Archiv für Ophthal.*, Bd. xxviii., 1882, and in his article references may be found to the literature up to that date.

Another case has since been described by Veron, *Recueil d'Ophthalm.*, Jan., 1883, Reviewed in ARCHIVES OF OPHTHALMOLOGY, vol. xiii., No. 2, p. 283.

A CASE OF ACUTE PRIMARY INFLAMMATION OF THE LACHRYMAL GLAND OCCURRING TWICE IN THE SAME INDIVIDUAL.

By J. F. FULTON, M.D., St. Paul.

THIS following observation appears interesting on account of the rarity of the disease and its very severe character in this case. Dacryo-adenitis must be very rare, as but very few cases are to be found reported in the very extensive literature of ophthalmology.

This is the only case I have met with in private practice.

Jules, in his recently published work on ophthalmology, says inflammation of the lachrymal gland is extremely rare.

Henry R. Swanzy, in his "Handbook of the Diseases of the Eye," makes this remark: "I have seen *one* case of acute purulent dacryo-adenitis, but no instance of the chronic affection."

Carter says: "The lachrymal gland is seldom diseased; insomuch that I have only met with a single instance."

Miss Maggie M., aged twenty, was sent to me about a year ago, by Dr. Leasure of this city, with a very extensive swelling of the upper lid, especially of its outer part, crowding down upon the eyeball so as to displace it downward and inward so that the patient could not possibly move the eye outward. The suffering of the patient was very great. The swollen, inflamed gland could be easily made out by manipulation with the fingers, and its outline could be seen between the ball and lid by elevating the upper lid as much as possible. This gland being placed in a depression of the orbital plate of the frontal bone can only advance forward into the orbital cavity when it becomes inflamed, and, by pressure on the

orbital tissue and the globe, is capable of producing great agony, as it did in this case. The conjunctiva was injected but produced no discharge. At the height of the inflammation this membrane became chemotic at the external canthus. The skin of the upper lid became quite red and continued so for a number of days. The pain was of a throbbing nature and very much increased by pressure, so that a digital examination was quite out of the question. An inquiry into the history proved that the patient had a similar attack about three years previous, with all the symptoms much less severe, which also ended in resolution. She was treated at that time by Dr. Atwood of this city and was cured in about two weeks. The patient was perfectly healthy and never had any form of eye-trouble. She never received any injury of the eye and never had acute or chronic conjunctivitis; so no cause could be found to account for the trouble. Both attacks seemed to be acute primary inflammation of the lachrymal gland, as no other tissues were involved except secondarily.

She was treated antiphlogistically. Several leeches were applied in the region of the swelling and hot compresses frequently applied. Under this treatment the inflammation soon subsided and the enlarged gland became less and less prominent from day to day. The leeches relieved the pain quite promptly. At the end of ten days the inflammation had entirely disappeared, and nothing remained save a slight enlargement of the gland, and this was completely removed by the repeated applications of an ointment of the iodide of potash.

The literature of this subject is not extensive. Galezowski and Mackenzie have written more at length on inflammation of the lachrymal gland than other authors. They both make what seems to be an unnecessary division of the subject, viz., (a) inflammation of the *palpebral* portion of the gland, and (b) of the *orbital* portion. In 1881 Galezowski reported seven cases in *Recueil d'Ophth.* In the transactions of the American Ophthalmological Society for '84 Pooley reports "A Case of Acute Dacryo-adenitis." In this paper Dr. Pooley says: "The interesting and unusual feature in my case is the occurrence of an acute inflammation of the gland during the course of an acute diphtheritic inflammation of the other eye, and raises the question in my mind whether it may not have been caused by septic absorption."

In the discussion followiug this paper Dr. Knapp said: "The cases which I have seen had no infectious origin, and in the majority of instances no conjunctival complications. Most of them did not suppurate." Dr. K. thinks if more attention were directed to this affection it would be found more frequent. Mr. Todd, in the Dublin Hospital Reports, describes a few cases, the most of which were the result of some form of conjunctival trouble.

A CASE OF SEVERE ORBITAL CELLULITIS, THE RESULT OF THE PASSAGE OF BOWMAN'S PROBE INTO THE NASAL DUCT.

By JOHN F. FULTON, M.D., Ph.D., St. Paul.

NOTHING could be more humiliating than the loss of an eye by so simple an operation as the dilatation of a stricture of the nasal duct; yet that such an accident may happen is indicated by the history of the following case:

Mrs. M., aged twenty-six, with general health in a fair condition, was placed under my care in October, 1883, by her brother-in-law, a German minister of this city. She was suffering with a blennorrhœa of the lachrymal sac, the result of a stricture of the nasal duct. This condition had been of about three years' standing. The chronic dacryocystitis was often aggravated by acute attacks of the inflammation, which gave rise to great pain, and extended to surrounding tissues. There was a large fistulous opening out on the cheek, through which the tears flowed, together with the discharge from the suppurating sac, which produced an eczematous condition of the skin. The patient being from the country, and extremely anxious to return as soon as possible, contrary to my usual custom I slit up the canaliculus and passed a No. 4 Bowman's probe at the first visit. The stricture was tight, but I succeeded in passing it without using much force. No violence whatever was resorted to. There was no hemorrhage into the nose following the passage of the probe. Patient was sent home with instructions to return on the following day. Forty-eight hours after this I was called to the patient's house and found her in great agony. An inflammation had extended from the lachrymal lesion to the orbital tissue; the symptoms being ex-

tensive, chemosis of conjunctiva, slight protrusion of the eyeball, and considerable tumefaction of the lids, especially the upper one. The pain was very great; referred to the orbit and extending down upon the cheek. The motion of the eye was considerably interfered with in all directions, and gave rise to pain. Fever had commenced a few hours before I saw the patient, and she was quite restless. The vision in the eyes was becoming dim. A brisk cathartic, leeches to the temple, and perfect quiet was the treatment ordered. I returned next day to find all the symptoms intensified, and the patient greatly alarmed, fearing that she would lose her eye, and disposed to blame her surgeon for the accident. The exophthalmus and limitation of the motion of the eyeball well marked; great hardness and infiltration of the orbital tissue. The cornea had become anæsthetic and the patient still more feverish, and the condition of the eyes was somewhat alarming. I was still in hope, however, that the parts could be relieved without suppuration, and in order to accomplish this a puncture of the greatly congestive orbital tissues was advised and urged. A Graefe's cataract knife was passed through the conjunctiva into the orbital tissues at the lower border of the orbit, near the inner canthus, between the recti muscles, and the swollen tissues freely incised down to the periosteum. This was followed by a free discharge of bloody serum. The same procedure was repeated at the upper and outer part of the orbit.

On the following day the parts were very much relieved, and continued to improve from day to day, and the symptoms had nearly all subsided at the end of ten days without doing any damage to the eye.

Cellulitis of the orbit is a rare disease, except as the result or complication of an erysipelatous inflammation of the face, or from caries of the orbital parietes. There was no suspicion of either condition in this case. Neither the examination before the accident, nor any during the course of future treatment extending over weeks, ever revealed any evidence of caries or of inflamed bone. This trouble is sometimes due to metastasis, but could not have been in this case, as there was no other seat of inflammation. She had no uterine trouble of any kind, and all the organs of the body were healthy. Primary orbital cellulitis is an extremely rare disease in healthy adults. It is met with in

delicate children, but in a mild form, and is easily controlled.

Dr. A. Hill Griffith in the *Ophthalmic Review* quotes Berlin as saying that the great danger of orbital cellulitis is the occurrence of thrombosis of the ophthalmic vein. "He states that even when this has taken place, resolution may occur or fatal pyæmia be set up without the process of thrombosis extending beyond the orbit; or lastly, sinus-thrombosis may supervene." It was this that produced the fatal result in the case reported by Griffith. The dimness of vision referred to in the clinical history of the case which I have reported was probably caused by the swollen orbital tissue producing a retardation and stagnation of the venous blood, and by pressure on the optic nerve. This was relieved by a timely puncture before any grave lesion of structure or function had taken place.

The manner in which the accident occurred must have been as follows: The dilatation of the stricture produced an inflammation of the surrounding parts; this extended by contiguity to the orbital tissue, and gave rise to the very severe inflammation of these tissues which I have described, requiring the most active measures to save the eyeball. This case shows that the most insignificant operation about the eye may produce a most severe and dangerous disease, and the great benefit to be obtained by an early puncture in cases of inflammation of the orbital tissues. In those very severe cases of orbital cellulitis which occur as a sequela of facial erysipelas, so dangerous to sight and even to life itself, it seems likely that they could frequently be cut short, and suppuration be prevented, by an early and efficient incision of the inflamed and swollen tissues of the orbit.

EVISCERATION OF THE GLOBE.

By E. L. HOLMES, M.D., of Chicago.

In the fall of 1876 a boy, seven years of age, in good health received a puncture of the left cornea, iris, and lens, from the blunt end of a small branch of a tree. Two days after the accident, when the case came under my care, I found the anterior chamber obliterated or partly filled with blood, fragments of lens, and shreds of iris. It was impossible to determine how far the branch had penetrated beyond the lens or whether minute particles of dry bark were within the globe.

The treatment was confined to rest and to the use of atropine and of wet compresses. There was no hope that the patient would regain useful vision, and scarcely a hope that the form of the eye would be preserved. In a few days the ocular conjunctiva and lids became œdematous with marked symptoms of panophthalmitis. There was less pain than is usual in such cases.

As it was soon evident that suppuration was progressing, I performed, with the assistance of Prof. C. T. Parkes, the following operation, while the patient was under the influence of ether. After the cornea had been removed by means of a cataract knife and scissors, pressure upon the globe expelled the intra-ocular contents, composed principally of degenerated vitreous humor mingled with pus and blood. By means of the tip of the finger the retina, choroid, and ciliary muscle were completely separated from the sclerotic and removed. Wet compresses upon the lids were the only applications in use. The œdema increased for a couple of days when convalescence proceeded as in ordinary enucleation.

I had already performed this operation in a few cases but cannot recall the particulars. Since the date above given I have often performed it at the Illinois Charitable Eye and

Ear Infirmary, in private practice, and at the Presbyterian Hospital,—in fact I have not extirpated a globe with panophthalmitis, but have in all cases simply removed the cornea and intra-ocular contents. I have never observed serious symptoms follow the operation.

I can scarcely be persuaded by my own experience that the use of antiseptic remedies in the operation of evisceration or enucleation, as in the large number of operations on the conjunctiva and lids, is of special advantage to the patient as compared with cleanliness attained by the use of water.

I have no means of ascertaining the total number of these operations I have performed during the past twenty-eight years. They are in the aggregate many hundred. I have never observed a single instance, in which an enucleation was followed by the slightest symptoms of cerebral complications, or in which an operation on the lids or on the conjunctiva did not heal kindly with the use of simple water-dressing. In deference to the opinion of many distinguished writers, however, I now apply invariably solutions of boric acid, borax, and bichloride of mercury. Their use in operations involving the cornea especially and the sclerotic I consider imperative.

The operation for evisceration of the globe has been recently recommended by Prof. Graefe, of Halle, and others, as if independent of previous operators, although it is mentioned in Well's work on the eye (Bull), and in the recent volume of Prof. Noyes. I have limited the operation to suppurative cases, but see no reason why we might not expect satisfactory results in nearly all cases of non-malignant disease, in which enucleation would otherwise be indicated. The subsequent condition of the orbit seems to be more favorable for the adaptation of an artificial eye than after the ordinary operation. Future experience must determine whether unlooked for danger may be encountered in this substitute for enucleation.

April 1, '85.

OPHTHALMOMETRY WITH THE OPHTHALMOMETER OF JAVAL AND SCHIÖTZ, WITH AN ACCOUNT OF A CASE OF KERATO-CONUS.

By SWAN M. BURNETT, Washington.

(*With three wood-cuts.*)

JAVAL and Schiötz exhibited their perfected ophthalmometer at the meeting of the International Medical Congress held in London in 1881. I have not been able to find, however, any published papers, embodying results of experimentation with the instrument by others, outside of two or three on the continent.[1]

In England and America, so far as my knowledge of their ophthalmic literature extends, no publication has been made.[2]

Having used one of these instruments in my daily practice for some months, I feel it but due to the ingenious inventors, and hope it may be not without interest to the practical ophthalmologist, to place the results of my observations on record.

Any description of the instrument itself is not necessary here, since this is accessible in the papers published by the inventors in the *Annales d'oculistique* for Juil.–Août, 1881; Mai–Juin, 1882; Juil.–Août, 1882; and Jan.–Fév., 1883. These articles contain all that is necessary for a thorough understanding of the principles on which the instrument is built, the method of its construction, and the manner of

[1] Laqueur, *Gräfe's Archiv*, xxx., 1, p. 99; Angelucci, *Ann. di Ott.*, xiii., fas. i., p, 35.

[2] Juler (*Brit. M. J.*, 1884, ii., p. 1274) speaks disparagingly of the instrument.

using it. From a careful reading of them, no practitioner with a knowledge of the fundamental principles of optics can have any difficulty in taking the instrument from its packing-case, setting it up, and manipulating it with satisfaction.

Its prime, and indeed only, function is the determination of the character of the corneal curvature.[1] That is its limitation; but when we consider that astigmatism is almost wholly corneal, and that it forms more than one half of the cases of refractive anomalies presenting for treatment, the importance of knowing the exact curvature of the cornea in all its meridians becomes apparent.

The ophthalmometer does not give us the refractive condition of the eye as a whole, and furnishes no positive indication as to the existence of myopia or hypermetropia,[2] but it gives with exactness the radius of curvature of the cornea in all its meridians; and, where there is a difference, it shows the direction of the principal meridians, and we can read on the instrument the amount of the difference in dioptries and fractions. The inventors claim that a difference of 0.25 D. can be readily detected, and my own experience would substantiate this statement.

The main question is: Is it practical? I most unhesitatingly answer: Yes. Taking all things into consideration, it seems to me the most practical of all the instruments of precision we use in the diagnosis of astigmatism. I have found many ophthalmologists who have confessed that they did not rely on the ophthalmoscope in the diagnosis of refractive anomalies. That seems to be an art which all cannot learn; but I can hardly imagine a practising oculist

[1] For which reason I think the term *keratometer* much more accurately descriptive than ophthalmometer. The term *keratoscopie* should be reserved for a simple inspection of the corneal surface without any measurements, as with Placido's circles or Wecker's square.

[2] Since writing the above, I have examined a case which demonstrates this very perfectly. In the left eye 110° had $r = 7.8$ *mm.*; 10°, $r = 8.4$ *mm.*; in the right eye 80° had $r = 7.8$ *mm.*; 170°, $r = 8.4$ *mm.* In both the bands crossed $1\frac{1}{2}$ steps. When it came to correction, however, it was found that L required +1.25 (110°), while R required −1.25 (80°). As the person was over sixty years of age, we could hardly suppose the existence of spasm of A in R. The M must therefore have been due to an elongation of the antero-posterior axis of the globe, of which fact, of course, the ophthalmometric measurements gave us no hint. I have also examined two cases in which M = 10 D existed in one eye, and E in the other; but both corneæ had the same radius of curvature.

that could not manipulate the ophthalmometer with success —certainly to the extent of detecting an astigmatism of 0.5 D.

Another advantage is the rapidity with which examination can be made. When the instrument is in position, it consumes even less time than an expert would take in making the same determination with the ophthalmoscope—that is, less than two minutes, including the reading and recording of the measurements.

No other form of keratoscopy can compare with it for precision and accuracy. I have used Placido's disc and Wecker's square, but must confess that in regular astigmatism I have found them worthless. They sometimes, in astigmatism of high degree, give indications as to the direction of the principal meridians, but I have never been able to estimate within two or three dioptries of the degree.

It is in cases of astigmatism of high degree, and particularly in mixed astigmatism, where the instrument of Javal is of most essential value, for it is precisely in such cases that the subjective methods of examination are so tedious. With the ophthalmometer you obtain at a glance the data required for a speedy solution of the difficulty.

I will not lengthen this paper by giving any tabular statistics, suffice it is to say that in about 100 astigmatic eyes I have not found a difference of more than 1 D between corneal and total astigmatisms, and that only in a single case. I will relate one case of kerato-conus in full, which not only shows the value of the instrument, but has also, I think, an interest and importance of its own.

Mrs. R., twenty-seven years of age, says she saw well up to her sixteenth year. At that time her vision began to fail, and gradually got worse until her nineteenth year, since which time it has remained about as it is now. On October 6, 1884, the time of the first examination, V = $\frac{2}{60}$. With -6^s she saw with either eye No. 60 at 4 metres, and no other spherical lenses gave further improvement. As is my habit, I then made an ophthalmoscopical examination before trying cylinders, since I thereby obtain at least some indications of the nature of the trouble, particularly if there is a high degree of astigmatism. On making this examination I at once found that I had to deal with a case of kerato-conus.

Even in the inverted image it was not possible to see all parts of the disc clearly, and there was that excessive parallactic movement of the vessels which is so characteristic of kerato-conus when this method of examination is used. When the light from a plain mirror was thrown into the pupil from a distance, as in the shadow test,[1] the peculiar unstable shadow crescent of conical cornea was beautifully shown. Examination by the direct method was in the highest degree unsatisfactory. At no time, and with no lens, could I get more than a part of two or three vessels in focus at once, and the least movement of the eye would throw those out of view and bring others forward. Some idea of the peculiar distortion of the vessels may be obtained from the accompanying diagram (fig. 1), which represents the disc as seen in the R eye, with

FIG. I.

+ 4 behind the ophthalmoscope. The black lines represent the parts of the vessels which were seen distinctly; the shaded portion, the parts that were out of focus.

The ophthalmoscope, therefore, which in cases of regular astigmatism of high degree is invaluable in giving us a clue to the character of the anomaly, was here of no avail.

The average radius of curvature of the normal cornea is somewhat less than 8 *mm.* In Mrs. R. the radius of curvature of the cornea was shortened in all the meridians, and in different parts of the same meridian, and a wide departure from the normal was found. The most nearly regular part was found, not directly in the line of vision, but about five degrees outwards in each eye. When in this position, the meridian in the R at 10° had a radius of curvature of only 5.4 *mm.*, and at 110° a radius of 6.8. The

[1] I think this name is preferable to keratoscopy, retinoscopy, pupilloscopy, phantoscopy, or any of the others that have been applied to this method of examination. Perhaps, for scientific nomenclature, we had better adopt the word *skiascopy*, as suggested by the French Hellenist, M. Egger.

left cornea had a radius in about the same locality of 5 *mm.* in the meridian at 180°, and of 6 *mm.* in the meridian at 90°. Even in these meridians there was a rapid change in these figures as soon as the point of measurement was removed a few degrees from the place indicated. The shape of the bands became very much distorted, and it was impossible to take accurate measurements. It was very evident, however, that the corneal surface became flatter as it approached the periphery. The distortion began much sooner on the outer side of the point indicated in both eyes. In R I measured the radius in 180° at some 20 degrees out and in from the apex, and found it inwards 7.5 *mm.*, and outwards 8 *mm.*, approximatively. The distortion was also greater in the upper than in the lower portion of the cornea.

These measurements, while showing a very great irregularity in the corneal curvature, gave me an idea of the direction of the meridians of greatest and least refraction near the visual axis, which was of great value in my further unravelling of the tangled threads of evidence. I read off on the arc of the instrument that in L, 180° had about 38 D, and 90° had 34 D—the difference being 4 D; and when the bands were in contact at 90°, they crossed 3½ steps of the graded arc at 180°. In R, 10° had 36 D (the normal being near 20), and 110° had 30 D, and the bands were superposed 6 steps at 10°, when they were in contact at 100.°

These data gave me no hint of the *character* of the regular astigmatism, but I now knew the *amount*, and approximately the direction of the principal meridians.

From the very short radius of curvature in all meridians, we naturally expected to find a high degree of myopia, but on testing with glasses it was found that while in L, with $-9-4^{cy}$ 180°, some letters of No. 12 were made out, in R some of No. 9 were seen, with $+4^{cy}$ 180° -2.5^{cy} 90°. No. 1, of Wecker was read by both at 8 inches. It should be stated that the examinations with glasses were repeated many times, and under the full effect of atropine; and the result as regards vision was the same with the same glasses, with and without the mydriatic.

Javal has added a Placido's disc to his instrument since 1881, and it has increased its value very much for the determination of *irregular* astigmatism. I had found the disc of Placido very useful for this purpose, and by it have discovered varying degrees of irregular astigmatism in many cases where V could not be

brought up to $\frac{20}{10}$ by any optical means. As we always have a certain and usually a very large amount of irregular astigmatism[1] in kerato-conus, I made careful examinations of both eyes of Mrs. R with the disc.

In fig. 2 is found the form of the disc at the corneal apex, 15° upward and downward, and 20° on either side in the left eye.

It will be observed in these figures that even at the apex there is quite a distortion below and to the outer side, while in all directions towards the base of the cornea the peripheral portions of the rings are drawn out and flattened, indicating a great reduction of its curvature at this portion of its surface. The striking feature about these figures, however, is their close approach to uniformity and similarity in form, indicating a much greater regularity of curvature than is

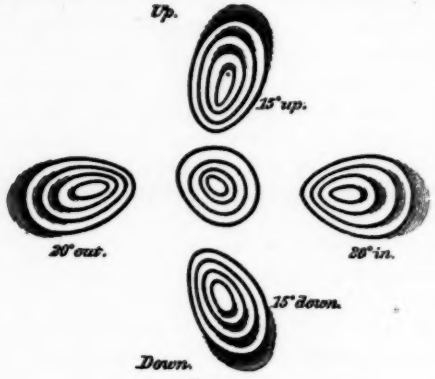


FIG. 2.

usually found in conical cornea, and much more regularity at apex than the cornea of the case of recent extraction of the cataract shown in fig. 3. In fact, if we are to judge from these figures, the cornea approaches in form in this instance to an ellipsoid of revolution, though of course we know by ophthalmometer measurements that there is a compression laterally, as shown by the existence of so large an amount of regular astigmatism. Such a case would seem, theoretically, to be well adapted to the use of hyperbolic lenses,

[1] See a paper by Angelucci in *Ann. di Ottal.*, xiii., 84, fas. 1.

and I much regret that I did not have an opportunity of trying them.

But the results obtained by cylindrical lenses are very gratifying, and encourage us to hope that with the aid of the ophthalmometer, many cases of kerato-conus, which have heretofore been deemed fit only for operation, will find a remedy in optical appliances.[1]

In the R eye the images of the circles were even more regular in form than in the L, and there was much less distortion at the apex of the cornea, and this is the eye which received the greatest benefits from the cylindrical lenses, vision being brought up to nearly $\frac{1}{1}$.

I have made ophthalmometric measurements of three eyes on which I had operated for cataract by extraction. Unfortunately none of these eyes were so examined before the operation, but it is a fair assumption that both eyes were nearly alike when the patients so state. In one there was that rather rare accident of a reopening of the wound nine days after the operation, and the examination was made only four days after it had again closed. At that time there was an astigmatism of 5.5 D in the meridian at 45°, corresponding pretty well with the place where the wound had given way, and the radius of curvature in that meridian was more than one millimetre longer than in the meridian at 135°. Examined fourteen days later, a marked change was found. 45° had now only 8.1 *mm*, while 135° had 8.4 *mm* radius, the difference amounting to 1.25 D, the *shorter* radius being now at 45°. When a $+ 1^{cy}$ with the axis at 45° was added to his cataract glass vision was much improved. In the second case the operation was a typical one, with Wecker's incision wholly in the cornea. There was no reaction until the ninth day, when an iritis set in. The wound had closed perfectly, but cicatrization was not complete on the eleventh day, when I made opthalmometric measurements. The extraordinary degree of irregular astigmatism is shown by the distortion of Placido's disc in fig.

[1] It now becomes a possibility that the hyperbolic lenses of Raehlmann, which have afforded decided advantage in cases of kerato-conus over cylinders, can be manufactured to order to suit each particular case from data furnished by the keratometric measurements.

3. Combined with this there was also a very large amount of regular astigmatism, as indicated by the elongated form of the disc.

On measuring the corneal curvature I found that 90° had $r = 9.9$ *mm* (11 D); 180°, $r = 8.$ (21 D); making a difference of 10 D. The cornea of the other eye (which was also cataractous) was free from astigmatism of any kind. It is interesting to note that the other eye, operated on since the above was written, followed the same course, the iritis lasting six weeks. It was accompanied by analogous changes in the corneal curvature. Both corneæ became subsequently almost normal in curvature.

In another case, four weeks after extraction, in which there were no complications, either during or subsequent to

FIG. 3.

the operation, there was a corneal astigmatism of 2.25 D, the more strongly curved meridian being at 100°; and vision was much improved by the addition of this cyl. to this spherical. The fellow-eye showed no abnormality in its corneal curvature. Measurements ten days subsequently showed a decrease of the astigmatism to 1.5 D.[1]

A number of accurate ophthalmometric measurements of eyes operated on for cataract by extraction, would give us valuable indications as to the kind of section which would be likely to give us a minimum of deformity in the corneal curvature.

Another field for usefulness of the ophthalmometer will be in the selection of a place for making an iridectomy in cases of leucoma of the cornea etc., where there is left any choice of clear cornea. The instrument will show us at once which portion of the corneal surface is most nearly regular, and under that we can make the artificial pupil.

[1] See papers on this subject by L. Weiss, These ARCHIVES, vi., p. 432; and Laqueur's paper, *l. c.*

A CASE OF GREAT SWELLING OF THE EYELIDS AND FACE FOLLOWING AN UNSUCCESSFUL ATTEMPT TO EXTRACT THE UPPER CANINE TOOTH ON THE LEFT SIDE; ABSCESS OF THE ORBIT; TOTAL BLINDNESS; ATROPHY OF THE DISC; OBLITERATION OF THE RETINAL VESSELS.

By Dr. SWAN M. BURNETT, Washington.

(*With one wood-cut.*)

John H. Davis, a colored man, aged thirty-five, was operated on for cataract of the right eye by extraction, in 1874, with partial success only. The left eye continued to have perfect vision until the 28th of January, 1884. At that time the upper canine tooth on the left side began to ache, and he went to a dentist for the purpose of having it extracted. This the dentist attempted to do, but failed after many persistent efforts. He told Davis that the jaw-bone was broken from the violence of the pulling. That same evening the left side of the face began to swell and be painful, and soon the left eye was closed. As it could not be opened for nearly two months, he was not able to tell whether there was any protrusion of the ball or what its condition otherwise was. At the end of twenty-one days, during which time there was fever, but no chill nor mental disturbance, a discharge set in from the region of the inner canthus, and afterward from the forehead and the cheek near the lower orbital ridge. When the swelling subsided so as to enable him to open his eye, he found that vision was abolished, not even perception of light remaining.

On the 20th of May, 1884, when I examined him for the first time, I found the eye in proper position and its movements perfect. There was a depression at the outer portion of the lower orbital ridge extending two *cm.* downward into the cheek, caused

by exfoliation of bone. There was no scar either in the skin or conjunctiva near the inner canthus. Exophthalmus was not present. There was no perception of light.

An ophthalmoscopic examination revealed a condition of the fundus shown in the accompanying sketch (fig. 1). The disc-surface is sharply outlined, dead white, and not excavated. From its lower edge there ran three white lines downward, one almost directly, one deviating inward, and one running downward and

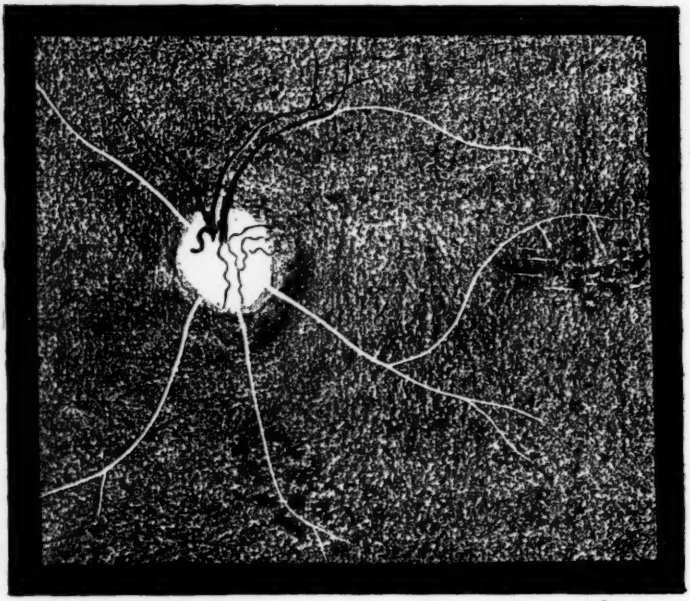


Fig. 1.

outward. This latter divided and sent a branch which ran the unusual course shown in the figure, passing upward to the level of the centre of the o. d., becoming nearly horizontal, and sending at the same time two short branches downward. The other branch passed diagonally downward and outward, and became forked, as did the other two white bands running downward.

From the upper edge of the disc one white band ran inward and upward for about the same distance as its companion on the same side below, but was not forked at the end. Proceeding from

a point somewhat above the centre of the disc and towards its inner edge there ran upward two vessels filled with blood, one smaller and lighter in color than the other. The lighter one curved slightly outward, sending one branch directly upward, and another, very fine, almost horizontal. The larger, darker vessel ran a course almost parallel to this one, but gradually diverged slightly to the outer side. It sent off no horizontal branch, but just where this branch should be given off there was a white band which ran outward and curved slightly downward. A very delicate light vessel ran upward and inward between the upper white band and the larger light vessel. On the surface of the disc several dark and very tortuous vessels were seen, all of them, except one, very delicate and fine ; three of them ran outward and two downward to the edge of the disc, but none of them could be followed over the border. None of the lines, either red or white, were broken—they were either red or white throughout,—but to the outer side of the smaller red vessel there was a distinct white line about $\frac{1}{4}$ of an o. d. in length, and the same thing was observed on the outer side of the larger dark vessel, just where it was joined by the large white line running horizontally. The fundus was even in tint, with the exception of two places : one above the bifurcation of the middle lower white band, and the other a little beyond the macula-lutea region and under the curve of the white line taking the unusual course. These alterations consisted in dark or black dots and larger masses, together with perfectly white and glistening dots and lines, which ran for the most part horizontally. These last alterations were found almost exclusively in the yellow-spot region as shown in the figure.

The interest of this case lies in the striking resemblance —the exact identity, in fact—of the ophthalmoscopic appearances to those found in blindness after facial erysipelas. If one will take the trouble to compare the drawing of our case with the fine chromo-lithographic plates of Knapp's case of blindness from erysipelas of the face in vol. xii. of These ARCHIVES, and Carl's case in *Zehender's Monatsbl. f. Augenheilk.* for April, 1884, it will be seen at once how all three agree in essential particulars. The question of the connection between erysipelas affecting the face and the orbital and ocular changes associated with it has been too recently discussed to render any further comment on the

subject necessary. Knapp has, from his careful observation of a case from the beginning, clearly shown, I believe, that all the intra-ocular changes are due to mechanical pressure within the orbit, and that none are due to the specific poison of the disease. Our case lends support to that view, for the clinical history does not warrant a diagnosis of erysipelas. On the contrary, it is almost certain that there was an abscess of the antrum of Highmore caused by a fracture of its walls from the forcible but unsuccessful attempt to extract a tooth, which led to the inflammation in the orbit. Further evidence of this is the destruction of a part of the maxillary bone at the lower edge of the orbit.

It has been known for a long time that abscesses in the antrum were attended by inflammations of the orbital tissues, followed by blindness. In 1862, Mr. James A. Satler, surgeon-dentist to Guy's Hospital, reported such a case in the Medico-Chirurgical Transactions, vol. xlv.; and he alludes in his paper to an article by A. Th. Brück on "Repeated Inflammations in the Antrum of Highmore and Amaurosis," published in *Caspar's Wochenschrift f. d. gesam. Heilk.*, March, 1851.

Reference to some of the more recent literature of orbital and ocular disease associated with dental caries can be found in an article by Vossius in *Graefe's Archiv* xxx., p. 157. Vossius' case, however, differs in many essential particulars from mine.

It can be readily understood how such abscesses of the antrum lead to inflammations and abscesses within the orbit. The wall of bone separating the two cavities is extremely thin, and will give way easily to the increased pressure within the antrum; or the inflammation might be propagated along vessels which may happen to pass from the one to the other.

A NEW CASE OF INJURY TO THE EYE FROM A STROKE OF LIGHTNING.

By Dr. CARL LAKER, of Gratz.

(*With a colored drawing; the upper one on plate viii.*)

Translated by Dr. J. A. Spalding, Portland, Maine.

I TAKE great pleasure in communicating a new case of injury to the interior of the eye from a stroke of lightning. The soldier thus affected met with the injury in Herzegovinia, but while being transported homeward I had an excellent opportunity of examining his eyes, as he remained for a few days in the hospital at this place.

Johann Zopko, æt. twenty-three, was sitting, with eleven of his comrades, during a passing thunder shower, in a small watch-house, in one of the windows of which a pane of glass was missing. A flash of lightning passed through this opening and into the guard-house without shattering the building or setting it on fire, and then disappeared in the ground, leaving only a large hole behind.

The entire twelve soldiers were more or less injured, but Zopko alone in the eyes. He declared that he fell unconscious to the ground, without noticing the flash at all. His comrades restored him to consciousness by chafing his limbs and body, but he does not remember how long he remained unconscious. When he came to his senses he could not distinguish between darkness and daylight, and suffered for several hours from violent tonic and clonic spasms of both lower extremities. He also felt excessively weak. He affirms that there were never any traces of external injuries visible, and when I examined him carefully I could discover no indications of traumatism or burns. For about a week he re-

mained totally blind, then vision began to return, and in about two weeks attained the amount at which it had remained constant up to the time at which I saw him, six months from the time of the injury. He asserted that the sight of the right eye began to return a few days previous to that of the left eye. The patient at present complains only of a periodical itching in his eyes, from which he never suffered before, and of his defective sight. He denies that he ever suffered at any time from photopsies, dazzling, hemeralopia, or photophobia, before or since the accident.

The patient can neither read nor write, for he was never sent to school, but he is sure that he could see as well at a distance as the average person previous to receiving the lightning stroke.

Refraction + 1 D, in both eyes, determined with the ophthalmoscope. Vision tested by Snellen's hook-types, R E, $\frac{6}{60}$; L E, $\frac{3}{60}$.

The objective condition of the eyes is as follows: Conjunctiva of the lids slightly catarrhal. Both pupils (more in the right eye than in the left) are somewhat eccentric and oval, rather dilated and very sluggish in reaction, as well to direct irritation of light as to sympathetic irritation. Nor do they dilate but slowly and hardly more than to half the normal extent after the instillation of a two-per-cent. solution of atropia, while even then they are simply more eccentric than before, the right medially, the left upward and still more oval than before. There is no trace of posterior synechiæ. Tension nearly normal.

Numerous dotted opacities are visible in the anterior cortex of the right lens by oblique illumination, while though also noticeable in the left cortex they are less abundant and moreover united by delicate linear opacities. The cornea and vitreous are perfectly transparent.

The ophthalmoscope reveals in both eyes a hazy, brownish-red retina and indistinct contours of the optic papilla. The arteries are somewhat thinner than normal and the vessels generally, especially near the papilla, show ill-defined contours where they run through the opaque layers of the retina. Both optic papillæ are grayish and discolored.

Peculiar conditions are visible at the macula lutea. In the right eye the locality of the macula is occupied by a bright-red, round spot, larger than the macula, surrounded by a border of pigment, in the centre of which lies a very distinct black speck; in the left eye and near the macula a larger, bright-red, rhomboidal-shaped spot, also surrounded with pigment, and very sharply defined

against the background of the eye. In the right eye there are, additionally, numerous zig-zag-shaped patches of pigment lying near the optic papilla, and beneath the retinal vessels. In the left eye there are no traces of similar pigment spots. The ophthalmoscopic figure (upper drawing on plate viii.) represents as faithfully as possible the exact condition of the alterations in the fundus of the right eye.

The light-sense is reduced in the right eye to $\frac{1}{4}$ (photometer scale of 5 *mm.*) and in the left eye to $\frac{1}{18}$ (photometer scale of 15 *mm.*) of the normal amount. The patient's replies to my various questions, while testing him with Foerster's photometer, were very accurate. Color-sense is normal for both eyes, and remarkably well developed in comparison with the patient's education in other respects. I was unable to decide whether the field of vision was contracted or not, owing to the absence of a perimeter, nor could I detect the presence of a central scotoma (probable as it might have been from the appearances at the macula), owing to the lack of intelligence on the part of the patient.

We have before us therefore a case of injury from a stroke of lightning, which, without doing any extensive harm to the body, as in the case reported by Leber,[1] produced total blindness, which began to disappear within a week, rapidly improved up to a certain amount, at which it then remained stationary for several months. The shock produced neuro-retinitis with retinal hemorrhages, alterations at the macula, and slight opacification of the lens, which must have remained about the same for at least six months, as otherwise the patient would have complained of deterioration of vision, or of photophobia and dazzling. In other cases reported by Servais[2] and Leber (*l. c.*) the cataract became total or continued stationary at a condition which rendered vision extremely poor (Downar[3]). The characteristic changes at the yellow spot in both eyes remind us that in all of the four cases of dazzling of the retina by direct sunlight which

[1] Ueber Cataract und sonstige Augenaffectionen durch Blitzschlag, *v. Graefe's Archiv*, Band xxviii., Abth. 3, page 255.

[2] Observation de cataract produit par la foudre, *Recueil de mémoires de médecine, de chir., et de pharm.*, 1864, page 229.

[3] Veränderungen im Auge nach einem Blitzschlag, ref. in *C. f. A.*, March, 1878, page 69.

Deutschmann has published[1] similar changes are recorded at the same locality, and that in the case of Downar (*l. c.*) the region of the macula was covered with hemorrhagic extravasations. Besides this, as in my case also, the neighborhood of the optic papilla was occupied by clusters of pigment which could not have originated in any other way than from previous hemorrhages in this vicinity. There does not seem to have been any paralysis, no matter how brief, of the levator muscle or swelling of the lids in the case of Zopko, either at the time of the stroke or later, although there were, at a subsequent stage, hyperæmia and hyperæsthesia of the conjunctiva, as described by Purtscher[2] in his case. Another interesting symptom is the extreme though unequal reduction of the sense of light in both eyes, but whether this may or may not account for the difference in the amount of vision in the eyes could not be accurately decided owing to lack of time at my disposal. Nevertheless, as positive testimony in favor of this question, we must remark that the eye in which the slightest objective alterations could be demonstrated showed the most extensive diminution of vision. The condition of the papillæ reminds us of that described in the case recently published by Pagenstecher.[3]

[1] Ueber die Blendung der Netzhaut durch directes Sonnenlicht, *v. Graefe's Archiv*, Band xxviii., Abth. 3, page 241.

[2] *v Graefe's Archiv*, Band xxix., Abth. 4, page 195.

[3] Injury of the Eye by Lightning, These ARCHIVES, xiii., page 26.

METASTATIC SARCOMA OF THE CHOROID.

By Dr. PFLÜGER, of Bern.

(*With a colored drawing, the lower one on plate viii.*)

Translated by Dr. J. A. Spalding, Portland, Maine.

INTRA-OCULAR metastatic tumors are so extremely rare that I venture to offer to the Archives a description of such a case, although I never saw it but once, and even then rather hastily.

Perls,[1] Hirschberg,[2] and Schoeler[3] have prescribed several cases illustrative of intra-ocular metastatic carcinoma, but there has so far been published, to my knowledge, but a single case of metastatic intra-ocular sarcoma, the one so accurately observed and carefully described by Dr. Schiess-Gemuseus, of Basel.[4]

May 4, 1882, I saw for the first and only time Miss H., æt. thirty, sent to me by a general practitioner for an opthalmoscopic examination.

The left eye is extremely amblyopic; S $\frac{1}{\infty}$. This reduction in vision has only been observed within the past six weeks. There are no pathological alterations anywhere in the fundus of the eye; no congestion-papilla, no optic neuritis, nor, on the other hand, any symptoms of optic atrophy. Tn.

The right eye has central S, $\frac{4}{8}$; field of vision exceedingly contracted to the right, the entire lateral half being absent. The limitation downward is somewhat less extensive. The ophthal-

[1] *Virchow's Archiv*, Band lvi., p. 437.
[2] *C. f. A.*, 1882, p. 376.
[3] *C. f. A.*, 1883, p. 236.
[4] *Graefe's Archiv*, Band xxv., Abth. 2.

moscope shows that the greater part of the medial half of the retina is elevated like a bladder and apparently covers the medial half of the papilla (see lower figure of plate viii.). The grayish-blue elevation is well defined against the rest of the fundus by a sharp curve, and is covered with delicate wavelets running up and down and with the dark, well-marked retinal vessels. Ophthalmoscopic measurements show that this elevation rises above the level of the rest of the retina from two, to three and a half millimetres at various localities. Toward the periphery of the retina the elevation gradually decreases in height, while it is most pronounced just above the lateral margin of the papilla.

The optic papilla, so far as it can be seen, is normal, with a small central funnel-shaped excavation, and is entirely free from any trace of inflammation or degeneration.

The pupils are of normal diameter and react perfectly. The sclera, so far as visible, is perfectly free from disease, and without a trace of suspicious pigmentation or any tumor-like formations. The position and mobility of the globe are normal. Tension is slightly diminished.

Metastatic melano-sarcoma having already been well defined in other parts of the body, there could be no doubt in this case of the proper diagnosis, which was given as metastatic sarcoma of the right choroid and probably of the cerebrum.

I append the history of the case as observed by the surgeons at the general hospital:

The parents, brothers, and sisters of the patient are all healthy. She had always been delicate, and suffered from indigestion and dyspepsia, but otherwise had never been afflicted with any serious illness. She was born with a flat, brownish speck, without hairs, over the right zygoma, to which she had given but little attention until about two years ago, when it began to itch so much that she kept continually scratching it. From this time the spot began to grow in size and to become very black. Since then, up to the time of her visit to the hospital, the increase in size had been steady, but without any pain.

September, 1881.—The patient felt a small gland at the angle of the right inferior maxillary bone, which gradually increased in size.

A physician whom she consulted soon after, advised her not to submit to extirpation of the tumor, which in November, 1881, had

grown to be as large as a hazel-nut, while around it lay several other small bluish nodules. A second gland near the former began to swell, while at New Year's, 1882, a third enlarged gland made its appearance near the two former. The same physician again insisted that an operation was inadvisable, despite the desire of the patient for removal of both the tumor and the glands, but he snared off with an elastic thread the greater part of the original tumor, an operation which was followed by profuse hemorrhage. Two days after the tumor fell off the patient noticed for the first time that she was losing the sight of her left eye. The position of the former tumor was soon filled up with the one which is now the largest. The patient has suffered from headaches since last autumn. A month ago they were extremely violent, recurring almost daily, but at present they are very slight.

Urine : No deposit, no albumen, no sugar ; S. G., 1,020.

May 3, 1882.—Patient is very anæmic. There is not much change about the face, but when she is provoked to laugh a slight facial paralysis of the right side is quite noticeable. A row of grayish-blue spots about as large as a bean, slightly elevated and slightly elastic to the touch, lies in front of the right ear. The smallest spots and those which show no elevation resemble varicose veins, while the larger ones look just as if grains of powder had been sprinkled into the skin. Most of the elevations are movable with the overlying skin. Near the angle of the inferior maxillary bone lies a bunch of confluent glands, which are somewhat painful upon pressure. A few of these are as large as a chestnut. The skin is slightly adherent at the most prominent point, otherwise unchanged. The smaller glands are elastic, the larger ones hard, to the touch. One small gland is discoverable in the supra-clavicular fossa.

The thorax offers no abnormity. A small nodule is visible on the right side in the region of the lumbar vertebræ. No swollen glands can be felt in the axilla, groins, or anywhere upon the legs. The liver does not appear to be affected in any manner.

The patient was discharged as unfit for an operation. Her family physician sent me the following history subsequent to her discharge from the hospital :

A short time after her return from Bern, *the patient entirely lost the sight of her left eye, and within a fortnight later the right eye be-*

came totally blind. As time went on the melanotic nodules and glandular tumors attained an enormous size. The whole right side of the head as far as the scalp was covered with tumors as large as peas and walnuts, and bore a rough resemblance to a gigantic bunch of blue grapes. In the last few months of life a dark tumor made its appearance in the anterior chamber of the right eye, while numerous darkly pigmented deposits developed upon the sclera. The relatives were particularly struck by the extremely dark appearance of the eyes as life drew gradually to a close. The eyes did not appear to lose their position or mobility up to the day of the patient's death, which occurred about the first of August, 1883. Fourteen days before her death total paralysis ensued. An autopsy was refused.

Remarks.—This was a case of sarcoma in a young person developed from a congenital nævus in the region of the right parotid gland (as in the case of Schiess-Gemuseus), followed by secondary sarcoma of the glands, with metastasis into the skin of the back and head, into the right choroid, and probably into the cerebrum.

Three years and a few months intervened between the period when the congenital pigment-patch began to enlarge and the death of the patient.

The case of Schiess-Gemuseus could not be examined ophthalmoscopically on account of numerous vitreous opacities, yet the anatomical examination revealed that the intraocular metastasis had originated from the optic papilla. In our case, on the contrary, the choroid must be regarded as the starting-point of the metastasis.

The colored sketch (plate viii.) shows without a doubt that the optic papilla in the portion not rendered invisible by the retinal detachment was normal.

The retina at the time of the ophthalmoscopic examination was not involved in the tumor, but elevated like a bladder, in the very same way observed in primary sarcoma of the choroid.

The sclera at a later date was occupied externally by melanotic tumors.

The blindness of the left eye suggests metastasis into the cerebrum. The absolutely negative condition of the eye

when examined with the ophthalmoscope leaves no other explanation possible, and excludes the supposition that the disease had advanced directly along the chiasma. The cerebral metastasis may further be diagnosticated by the persistent headache, occasionally violent in the extreme, as well as by the total paralysis a fortnight before the death of the patient.

In 1875 I observed a similar propagation of blindness by cerebral metastasis in an old lady who was attacked with sarcoma of the uveal tract in an eye which had been rendered blind by traumatic agency. She had refused an enucleation previously, but desired to have it performed when after months of furious headache she became blind in the other eye, in which, however, there were no ophthalmoscopic alterations.

EXOPHTHALMUS:

ITS SYMPTOMATIC IMPORTANCE AS AN OCCASIONAL ATTENDANT OF HEMORRHAGIC FORMS OF RETINITIS, OCCURRING IN CONNECTION WITH ALTERED AND INCREASED GENERAL ARTERIAL PRESSURE, THE RESULT OF CARDIAC, RENAL, AND HEPATIC LESIONS.

By Dr. ROBERT SATTLER, Cincinnati, O.

IT can be admitted, that the causes of exophthalmus can in a large number of cases be readily determined. On analysis, they will be found to depend upon mechanical conditions, situated either within the orbit or in its immediate vicinity.

The various intra- and extra-orbital lesions of idiopathic or traumatic origin occasion in most instances a marked degree of protrusion or dislocation of the globe, proportional to the space occupied by the neoplasm, etc., or the products of an idiopathic inflammation or traumatic lesion within the cavity of the orbit, its walls, or its surroundings. It constitutes in most cases of this character, a conspicuous and pathognomonic symptom.

In other instances exophthalmus is a prominent symptom, but cannot be considered pathognomonic as in the first group. In exophthalmic goitre it is occasionally absent, slight, periodic, or transitory. It is conspicuous as a symptom in those interesting cases of so-called pulsating exophthalmus (rupture of the internal carotid within the cavernous sinus), and equally so in connection with that even more infrequent and obscure affection—thrombosis of the ophthalmic veins and intracranial sinuses.

In the latter group of cases, as also among the more infrequent forms of disease, such as bulging of the orbital plate of the frontal bone, the result of congenital or acquired hydrocephalus, cystoid disease of the ethmoid, lesions of the antrum, etc., dislocation of the globe, either slight or pronounced, is also due to mechanical influences.

In addition to these various causes there remain a number of recorded observations in which exophthalmus was a pronounced and conspicuous symptom, but with no explanation at all rational or satisfactory to account for its occurrence.

Under this group I purpose to mention three cases, among which this symptom appeared in connection with, and probably the result of, altered arterial pressure or tonus dependent upon pathological alterations in important organs, notably the kidneys and liver, associated with compensatory hypertrophy of the left ventricle and other changes of the circulatory system.

I append a brief report of the cases. It is possible that the dislocation of the globe was a mere coincidence; howsoever if it was, it is of sufficient interest and rarity to deserve mention.

In the first case, without a pronounced organic lesion, its occurrence was sudden and its duration short, followed by complete subsidence of the exophthalmus and restoration of function of the eyes.

In the second case, with fatal termination and the existence of pernicious anæmia, albuminuria, etc., it was marked, and persisted throughout the life of the patient.

In the third case its appearance was sudden and temporary and it existed only during the initial stage of the retinal lesion and disappeared after the lesion had made active progress. It differed from the exophthalmus which developed later on, which was due to hemorrhagic extravasation into the capsule of Tenon and into the retro-bulbar tissues. At this stage of the disease the case resembled the rare and interesting one reported by Wharton Jones, in the *British Medical News*, 1863.

Mechanical causes, in all three cases, could be excluded. Exophthalmic goitre could also be dismissed as a probable

cause in the first and third cases, and in the second no goitre or other specially distinctive symptom existed, and it was far more probable that a pernicious form of anæmia constituted the causative factor for all the symptoms.

Retinitis Hæmorrhagica—Active Cerebral Congestion—Great Impairment of Sight—Transitory Exophthalmus—Complete Restoration.

J. L., æt. fifty-six. Strong and muscular man. History of impaired vision, obscure nervous phenomena, mental depression, and emotional disturbance, paroxysms of active cerebral congestion (?), vertigo, etc., for two or three weeks. Ophthalmoscopic examination revealed typical picture of retinitis hæmorrhagica, with numerous characteristic large and small hemorrhagic extravasations in, on, and around disc. Functional ex.: V oc. sin. = 0.3; oc. dex., 0.5. Pronounced exophthalmus of both eyes; muscular movements unimpaired. Pupils active. Urine free from albumen. Heart-sounds normal, but second sound intensified; no bruit. Marked pulsation of carotids. Under rest, cardiac sedatives, etc., the exophthalmus gradually disappeared, and absorption of the retinal hemorrhages with restoration of almost normal vision resulted.

The patient has been repeatedly examined and no recurrence of the retinal lesion and of its uncommon associate-symptom, exophthalmus, has been observed.

Retinitis Hæmorrhagica seu Albuminurica—Hemorrhagic and Exudative Infiltration, Detachment of Retina—Grave Renal and Cardiac Lesions—Total Blindness—Marked Exophthalmus—Death.

Miss H., æt. twenty-two. Gradual impairment, commencing about three months ago, and resulting in complete suspension of vision within the last week.

She has always been amblyopic, due in part to macula corneæ, the result of keratitis phlyct. during childhood, and in part to a high degree of myopia. Her eyes have always been full, if not prominent, but within the last four weeks more pronounced prominence has been observed by the parents and friends.

Ophthal. ex. discloses most marked changes. Details of fundus not visible; grayish reflex in some parts, and complete absence in other parts. Anterior refractive media, with exception of opaci-

ties of cornea, transparent. Anterior portion of vitreous hazy and traversed by floating masses.

Funct. ex.: V = o, oc. amb. Marked exophthalmus of both eyes. Muscular movements of globe unimpaired; no retraction of upper lid. Pupils dilated and fixed.

The urine loaded with albumen. No œdema of lower extremities or of face. Action of heart forcible and tumultuous; second sound intensified; loud systolic bruit at base, over aortic orifice.

While under treatment for relief of the general symptoms, the marasmus and prostration became more and more pronounced. The blindness and the exophthalmic condition of the eyes, however, remained unchanged until the inevitable lethal termination occurred.

I am indebted to Dr. S. C. Ayers for the notes of this case.

The next case, in many respects, was phenomenal, both so far as the clinical manifestations and also so far as the negative results of the *post-mortem* examination were concerned.

Retinitis Hæmorrhagica seu Albuminurica.—Oc. Amb. Complete Abolition of Sight—Transitory Exophthalmus—Spontaneous Hemorrhagic Extravasations into Orbit, Capsule of Tenon, Conjunctiva, and Subcutaneous Tissue of Lids—Chronic Granular Nephritis—Death.

E. S., æt. fifty, discovered accidentally in Sept., '84, that his right eye was defective in vision, and immediately afterward came to me for advice.

Functional examination: V = o.1, oc. dext. Tension and pupillary movements normal; marked prominence of eye; muscular movements undisturbed.

Ophth. exam. disclosed a typical form of hemorrhagic retinitis, but with absence of those characteristic alterations in macula-lutea region, so generally met with among albuminuric varieties.

The patient's previous history rendered the existence of morbus Brightii and also secondary lesions of the heart probable.

The urine, which was not perceptibly increased or diminished in quantity, contained albumen. Physical examination of the heart sounds revealed a forcible and diffused apex beat; on auscultation, a tumultuous and irregular action, intensified second sound, and a systolic bruit were heard.

Pulsation of the carotids very marked, and visible pulsation of the more superficial arteries of the face and head—facial, naso-ciliary, temporal, etc. Palpation discovered a rigid and atheromatous characteristic of these vessels.

Under rest, sedatives, ergotin, local depletion, etc., a temporary improvement of vision occurred, and also a recession of the prominent globe.

About four weeks afterward, impairment of vision, subjective glimmering, and distressing luminous appearances were noticed in the left eye. The vision of the right eye also became suddenly more impaired and was rapidly reduced to perception of light.

Ophthalmoscopic examination of the left eye, which had however been repeatedly resorted to before with negative developments, revealed extensive changes, hemorrhagic extravasations, œdema, and marked swelling of disc. Pupil dilated and fixed ; marked exophthalmus ; vision reduced to movements of the hand. Muscular excursions of globe undisturbed.

The treatment, consisting of local depletion, rest in bed, sedatives, etc., failed to exert the slightest favorable influence upon the disease, in either eye, after this period. In the left eye, after the exophthalmus had remained pronounced for three days, a gradual recession took place. The intra-ocular tension, which was increased from the onset, became more pronounced, and the eye presented a typical glaucomatous appearance. This, it seems, was due to hemorrhage into the iris, anterior chamber, and probably also the ciliary body.

Eserine, warm fomentations, etc., did not influence either the excessive tension or the excruciating pain, and paracentesis of the anterior chamber was performed under cocaine. Although the aqueous was evacuated, drop by drop, and with the greatest caution, rupture of numerous vessels of the iris immediately followed, so soon as the tension was reduced by the gradual flowing off of the aqueous. The operation, instead of affording relief, really aggravated the dangers for the relief of which it was performed.

In the course of the next two weeks, a gradual increase of all symptoms, both subjective and objective, took place. Light was completely abolished ; exophthalmus had disappeared. Glaucomatous invasion had also occurred in the right eye. Suffering was intense.

About Nov. 15th, in spite of anodynes, etc., the excruciating

suffering persisted; exophthalmus of the left eye suddenly developed. The muscular excursions were restricted, and the orbital tension was perceptibly increased. In addition, ecchymosis of the conjunctiva, and hemorrhage into the subconjunctival tissue, rendered the supposition of bleeding into the capsule of Tenon and cellular tissue of the orbit more than probable.

In the course of several weeks the exophthalmus and ecchymoses subsided, and about this time, Dec. 6, '84, the sclera of both eyes commenced to bulge, and a deformity, particularly in the left eye, developed, that would baffle description. The enlarged globe was conical in shape, and surmounted by large and small, most irregular prominences. No pain was referred to the eyes, but constant and excruciating suffering, uninfluenced by anodynes, was referred to the right parietal region.

The general arterial pressure remained increased, the action of the heart tumultuous and irregular. The urine was frequently free from albumen for several days.

From Jan. 1, '85, general prostration became more pronounced. Spontaneous rupture of one or the other of the numerous ectasiæ of the sclera, which seemed almost inevitable, did not occur, but toward the end of Jan. the pain, which until then had localized itself in the right parietal region, was suddenly transferred to his lower limbs. Examination revealed typical spots of purpura hæmorrhagica over both lower extremities, notably the right one. From this time on, marasmus and general prostration steadily increased, and the patient succumbed to his protracted suffering in March, '85. The left globe was so prominent and ectatic at and before the date of death, that the lids could not be closed over it. For several months no pain was referred to the eyes. Œdema of face or extremities never existed, and no evidences of uræmia manifested themselves. The action of the heart remained forcible and irregular to the last, and the systemic vessels retained the throbbing characteristic and strong impulse.

A FRAGMENT OF STEEL REMOVED FROM THE BACKGROUND OF THE EYE, WITH THE ELECTRO-MAGNET.

By Dr. GEO. T. STEVENS, New York.

On the evening of December 23, 1884, Mr. F. A., while opening an iron-bound cask, sent by a blow from his hammer a fragment of steel flying against the lower lid of the left eye. The shock of the stroke was felt, and at once there was confusion of vision. The gentleman called on me within an hour or two after the accident, when an examination was made by myself and Dr. Featherstonhaugh.

At the border of the lower lid, a little outward from the middle of its extent, was an abrasion of the skin with ecchymosis. A minute opening was seen at the conjunctival portion directly within, showing that the foreign body had evidently passed through the entire thickness of the lid. A corresponding point in the ocular conjunctiva exhibited also ecchymosis and a minute, penetrating wound, the latter situated 7 *mm.* below the border of the cornea and almost in the vertical meridian.

Using the ophthalmoscope, evidence at once appeared that a foreign body had penetrated the globe. Upon closer examination the following conditions were found:

There was a stellate laceration of the posterior lens-capsule, external to the centre of the lens and a little less than half the distance between the centre and periphery. Five or six lines radiated from a common centre, and below this a portion of the capsule appeared to be detached from the lens.

Beyond and in the retinal plane a long, straight, dark line, very conspicuous and having a diameter equal to one of the principal arteries, was seen. It extended from a point above the macula higher than the upper border of the optic disc, traversed the

region of the macula, and extended downward toward the lowest part of the retina, where it seemed to be lost in a somewhat extensive hemorrhagic extravasation. Owing to the lacerations of the capsule, and especially to the detached portion, it was impossible to trace the line in its lower part after it passed into the extravasation.

In the upper part of this extravasation appeared a small, feebly, lustrous, angular point, which was, doubtless, at least a portion of the foreign body. The confusion of the ophthalmoscopic image in the lower part of the field already mentioned, rendered it impossible to trace a direct relation between this point and the mark so conspicuously seen traversing the region of the macula. This long streak was at once suggestive of a foreign body, but it was destitute of the metallic lustre seen at the point below, yet the fact that its lower portion was somewhat advanced in front of the general plane of the retina, was shown by the circumstance that that portion could best be seen by a rather strong convex lens behind the ophthalmoscope, while in its main course it could be best seen without the lens.

The subsequent history of the case removed all doubt as to the nature of the conspicuous streak, and proved that it was the principal portion of the foreign body veiled by the overlying retina ; while the lower and, as it proved, the broader extremity, remaining at the vitreous side, exhibited in the midst of the hemorrhagic space a faint metallic lustre.

In fact, the principal portion of the foreign body had lodged between the choroid and retina, and extended from the lowest point in the equator through the point of the macula and above the upper border of the disc.

The gentleman was seen on the following morning, when all the observations of the preceding evening were confirmed. The gravity of the accident was pointed out to him and he was advised to subject himself to an operation for the removal of the foreign body, with the assurance that even if the foreign body should be successfully removed cataract must follow. At my request he at once consulted Dr. H. Knapp, who was in full accord with me in the view that an immediate attempt should be made to remove the foreign substance.

Accordingly, on the same day, Dr. Knapp and Dr. Featherstonhaugh being present and kindly assisting, the operation was performed as follows :

A solution of cocaine having been applied, a narrow blade was thrust directly through the conjunctiva and sclera into the globe of the eye, below the cornea and a little to the temporal side, then by a sweeping movement as the blade was withdrawn the opening was extended downward and outward. The wound thus made was 5 *mm.* in extent. The needle of a very strong electro-magnet was then introduced within the globe, its point being directed as accurately as possible toward the position in which the lustrous substance had been observed. Withdrawing the instrument slowly and with much care, we had the great satisfaction of seeing attached to its extreme point a long needle-shaped spicula of steel. A single drop of vitreous escaped.

The lips of the wound closed very perfectly, and no precaution beyond the use of a slight compress was taken to insure union.

On the following day the capsular and lenticular opacities had extended considerably, yet not enough to prevent an inspection by the aid of the ophthalmoscope, when it was discovered that the dark line across the retina had disappeared.

The patient remained in his room two days, no dressing or special care being enjoined. The progress was in the highest degree satisfactory, the wound healing so quickly, and other appearances of injury disappearing so rapidly, that within a week after the operation there was no very noticeable evidence of injury to the eye.

The cataractous condition advanced slowly, and during several days permitted not very extensive yet quite satisfactory inspections of the fundus of the eye by the ophthalmoscope. These examinations showed that no marked reaction occurred in the retina, and the entire absence of the conspicuous line caused by the presence of the spicula of steel beneath the retina.

During the months of January and February the amount of vision permitted by the cataract was enough to be rather annoying than otherwise, but by the end of March the cataractous condition was sufficiently established to practically exclude the eye from any special participation in the visual act.

The fragment of steel was 5 *mm.* in length, and may be best compared in general outline to a similar length broken from the point of a No. 7 sewing needle, but having sharp angles.

In a successful case of removal of steel from the retina reported by me in *Transactions of American Ophthalmological Society*, 1875 (see also ARCHIVES OF OPHTHAL-

MOLOGY, vol. vii., page 333), and which is the only other instance of removal of a foreign body from the retina which has come to my observation, hemorrhage followed the operation on the seventeenth day, succeeded by gradually improving vision. In this instance no complicating circumstance has succeeded as the result of the operation.

Two especially interesting and unusual phenomena in this case deserve attention.

1st. The position of the foreign body, rendering the diagnosis of its exact nature obscure. In its main course it was beneath the retina, and hence exhibited no metallic appearance. The extremity which remained on the vitreous side was very small, was surrounded by hemorrhagic extravasation, and, owing to the condition of the capsule, badly seen.

2d. A curious question arises in regard to the manner in which the capsule was lacerated.

It seems beyond question that the course of the spicula was very direct through the lid, the sclera, the vitreous, and beneath the retina. In this course it would have been impossible for it to have come in contact with the capsule at the seat of the injury. Again, the capsule was not scratched nor the substance of the lens injured, as would have been the case had the needle of steel rebounded against it.

Only one explanation occurs to me as consistent with all the circumstances: *laceration of the capsule as the result of sudden tension.*

At the instant when the shock of injury was received, the eye was strongly accommodated, the ciliary muscle being in a state of decided tension. The patient was thirty-eight years of age, and the lens had not all the flexibility of youth. The shock caused an instantaneous relaxation of the accommodation, and a correspondingly instantaneous tension of the capsule; the lens being slow to yield, the tension was too sudden and too great, and the capsule gave way in the stellate fracture described and with a small flap entirely detached.

EXAMINATION OF THE REFRACTION AND BASAL LINE OF THE EYES, AND OF THE DYNAMIC RELATIONS OF THE LATERAL MUSCLES IN GIRLS FROM FIVE TO EIGHTEEN YEARS OF AGE.

By Dr. OTTO BESELIN, Heidelberg.

Translated by Dr. J. A. Spalding, Portland, Maine.

SIX years ago, 250 school-girls in Heidelberg were examined with the ophthalmoscope, and their refraction, vision, pupil-distance, color-vision, and (by v. Graefe's method of equilibration) the dynamic relation of their lateral ocular muscles determined.

Four years later the examination was repeated, but this time with 375 girls.

The results discovered in 1879 were demonstrated in an academical thesis, but never printed. I have, however, incorporated them into this paper, because I thought it of interest to compare the former results with the present, especially in the case of the 61 girls who happened to be included in both examinations. I have also had at my disposal numerous notes by Prof. Becker, exhibiting the maxima of abduction and adduction, as well as the results of his investigations into v. Graefe's law of equilibrium in 256 persons, together with the pupil-distance in 545 people in comparison with their age and refraction.

So many examinations of the refraction of the eyes of school-children have been made of late years that our figures of course show nothing new, and can only serve to confirm and amplify the results already obtained by numerous competent observers. But inasmuch as our examina-

tion of the dynamic relations of the lateral muscles opens up a hitherto unexplored field of investigation, we feel that we have a right to call special attention to the same, and all the more urgently since, so far as I know, no similar investigations have ever been made amongst subjects of so youthful an age. Furthermore, since eyes whose muscles are apparently not affected often reveal important variations when subjected to an examination, it is possible that the study of this especial point from conditions which are nearly if not absolutely normal, may offer us a key to symptoms which in other persons are excessively increased and may therefore be strictly regarded as pathological.

The refraction was measured, independently, with glasses held before the eye, and with the ophthalmoscope. Whenever these results differed, the first test was regarded as the best in cases of astigmatism only,[1] while in all the others the ophthalmoscope was considered the most accurate test, because many errors which must have crept in when the patients were tested with glasses, from excessive tension of the accommodation, could be easily avoided in the examination with the ophthalmoscope. Owing to these precautions M was found to a less percentage, H proved to exist more frequently, and even apparent E to be H.

We have included slight degrees of H, M, and As under E when of less amount than 1 D, a step which appears justifiable when we reflect that, strictly speaking, there is no such thing as a perfectly emmetropic eye, because a perfectly symmetrical cornea does not exist. M and H of $\frac{1}{2}$ D, or even of 1 D, are scarcely perceptible to those affected, and rarely demand correction with lenses. Such a step of course reduces our percentages of M and H, yet in taking it we shall obtain a more accurate idea of the number of eyes which correctly speaking require a compensating glass, and this is one of the chief aims of our examinations and tests.

We did not pay much attention to different degrees of the same variety of refraction in both eyes, but those cases with more than 1 D of H on the one side, and of M on the other, are classified separately. The same has been done

[1] The OS test of astigmatism is more reliable than the functional, which brings out astigmatism only so far as it is corrigible.—(H. K.)

with the cases of M or H in one eye, and E in the other, because in a practical point of view it appeared necessary that these persons should not be classified with those who were ametropic in both eyes.

Our results[1] vary somewhat from those of other observers, because we have examined on different principles. Many have collected the slightest degrees of M, and of course in this way obtained higher percentages. Others, again, have unconsciously passed over many cases of H, and examined the refraction of such cases only as showed decreased vision. In this way their percentage of H is very small in comparison with ours. Again, there is a great deal of difference between the examination of boys from nine to nineteen years of age, and that of girls from five to eighteen. Some observers, finally, have examined every single case with the ophthalmoscope, and found larger percentages of H than we, because they included all degrees of H.

V. Reuss,[2] amongst others, examined the refraction of all his cases with the ophthalmoscope, but he too reckons even the slightest degrees of H. In his paper we find the refraction obtained with tests by lenses compared with that obtained with the ophthalmoscope, and from his tables we see to what extensive variations the two methods may give rise. Thus, as determined by lenses, M showed 55 per cent., H 10 per cent.; with the ophthalmoscope, M 37 per cent, H 28 per cent. Hoffman's examinations[3] with the ophthalmoscope yield about the same results.

It is a well established fact, and one that does not at present need any additional proof, that heredity exerts a great influence in the production of M. This we see every day before us. Yet Hermann Cohn has lately objected that, although a hereditary predisposition is possible, and even probable, we have not yet demonstrated that it exists in the generally assumed manner. Cohn has only found M in about three per cent. of one at least of the parents of short-sighted children that he had previously examined, figures upon

[1] Four extensive tables have been suppressed in this translation.—ED.

[2] Beitraege zur Kenntniss der Refractionsveränderungen im jugendlichen Alter. *V. Graefe's Archiv*, Band xxii., Abth. 1, pag. 231.

[3] *Klin. M. f. A.*, Band ix., pag. 269.

which he lays but little value, because they depend entirely upon random questions put to the children themselves. The most convincing way to discover the part played by heredity would be to examine thousands of children as well as their parents, an investigation which will hardly be undertaken in our days, owing to its enormous attending difficulties. Still, I will not hesitate at this point to mention the results which I have obtained from investigating the sight of the parents of thirty myopic children, viz.: one or both of the parents myopic 18 times, neither of the parents myopic (but twice brothers or sisters myopic) 6 times; no certainty whether myopic or not, 6 times. In other words, in 60 per cent. of 30 children the parents were, one or both, myopic.[1]

Amongst the girls whom we examined, 61 had passed through the same ordeal four years before, and the notes then made were compared with those of the latter examination. Here we find a considerable number of variations in refraction during this long interval; cases of H becoming less marked or even E, cases of M appearing in eyes which had previously showed E, and finally cases of M increasing from lower degrees of the same refraction. We did not find any changes in a reverse order. *In making this comparison, alterations of refraction of* 0.5 *D are not included, because there may have been unavoidable errors at either examination.* Nor is E reckoned as in a former part of this paper, but as it seemed proper to include variations of 1 D only, a decrease of H and M of this amount is here included. Besides this, an alteration of refraction in one eye only is also counted.

TABLE I.

1	E, as before.	9
2	H, " "	14
3	M, " "	4
4	H, decreased.	1
5	H, changed to E.	12
6	H, " " M.	4
7	E, " " M.	7
8	M, increased.	3

[1] Inquiries into hereditary tendency should include the condition not only of parents, but of uncles and aunts, grandparents, granduncles, and grandaunts.—H. K.

The most noticeable variation was a case which changed from E to M 4.5 D, and a second with M 10 D, which resulted four years later in M 16–18 D in the right eye and M 14 D in the left.

The previous table demonstrates that out of 61 girls 27 showed a variation of refraction of more than 0.5 D within a space of only four years, a number which must remain very large even if we withdraw a few of the cases in which the first or second examination may possibly have been imperfectly performed. The vision, however, of these girls does not appear to have changed very much after correcting-glasses were prescribed.

Careful examination of our next tables[1] shows that at the first examination fifteen per cent. of the girls had defective vision, and at the second examination fourteen per cent. If we arrange these cases according to the different conditions of refraction, we find that the proportion of reduced vision increases in the following order: E, H, M, As; for while the E eyes in 1879 showed six per cent. of defective vision and five per cent. in 1883, and while the H eyes showed of the same thirteen per cent. in 1879 and fourteen per cent. in 1883, the percentage increases in M to thirty-seven per cent. in 1879 and twenty-nine per cent. in 1883, and finally in As to seventy-seven and even one hundred per cent. of reduced vision. Of myopes, therefore, fully one third lack a normal amount of vision. The sight of the As eyes was tested while holding in front of them, in a frame, the most perfectly correcting cylindrical glasses. Four of these girls showed a great decrease of vision and of a varying amount in each eye.

Erismann found the same percentage (fourteen) of diminished acuteness of sight in 4,358 children, and he remarks that "this amount of defective sight may be regarded as about the normal average for people who pass their lives in cities."

We undertook careful measurements of the basal line of the eyes in order to obtain its average length at various ages, and to discover if there were any relation between the same

[1] Two tables exhibiting the vision in 700 cases are here omitted.—Ed.

and the various conditions of refraction. We employed for this purpose Weiss-Landolt's double-ruler, the children fixing, over it, a given point at a proper distance.

Our results are shown in

TABLE II.

Pupil-distance in millimetres of 246 girls, in 1879.[1]

Refraction.	Age 8-10.	Age 11-13.	Age 14-16.	Age 17-18.	Average (above); Total (below).
Em	55	57.6	59.1	58.7	57.1
	57	63	44	4	168
H	53.7	55.6	57.9	—	55.1
	9	19	9	—	37
M	57.0	57.2	58.9	60	58.1
	3	10	15	1	29
As	57	58.1	61	—	58.2
	2	6	1	—	9
1 Eye H	55	51	—	—	53.6
1 Eye M	2	1	—	—	3
Average distance;	54.9	57.1	58.9	59	57.2
Total	73	99	69	5	246

TABLE III.

Pupil-distance in millimetres of 358 girls, in 1883.

Refraction.	Age 5-7.	Age 8-10.	Age 11-13.	Age 14-16.	Age 17-19.	Average (above); Total (below).
Em	54.7	55.9	57.2	60.2	63.7	57.2
	31	72	80	48	4	235
H	55.1	56.5	57.8	58.0	—	56.7
	16	32	24	3	—	75
M	56.0	56.0	58.3	59.6	59	58.4
	1	5	12	13	2	33
As	54.0	58.3	60.3	60.6	56.5	59.0
	1	3	3	5	2	14
1 Eye H	—	—	—	61.0	—	61.0
1 Eye M	—	—	—	1	—	1
Average distance;	54.8	56.2	57.5	60.1	60.8	57.3
Total	49	112	119	70	8	358

[1] The upper figures in this and following tables indicate the average distance in *mm.*; the lower ones, the number of girls examined.

TABLE IV.

Pupil-distance, according to the sex and age, of 545 individuals. (*Prof. Becker.*)

Age.	—10	—15	—20	—100
Men	53.9	56.1	58.9	60.1
298	15	38	49	196
Women	51.2	55.1	57.8	57.5
247	12	25	36	174

TABLE V.

Pupil-distance of 545 persons, arranged according to sex and refraction.

Refraction.	E.	H.	M.
Men	60.4	58.1	59.6
298	59	97	122
Women	60.4	56.9	58.3
247	38	135	74

TABLE VI.

Pupil-distance of 545 persons, arranged under myopia and hypermetropia according to age.

Age.	—10	—15	—20	—100
M	53.2	57.2	59.1	60.2
	8	28	40	140
H	52.5	54.1	58.1	57.5
	17	24	25	166

The five preceding tables show that the length of the basal line increases with great regularity with advancing of years; from five to sixteen years of age about 5.3 *mm.*, and from eight to sixteen years about 4.0 *mm.*, or on an average a yearly increase of 0.5 *mm.* After the sixteenth year the increase is slight. In girls the length of the basal line attains its maximum at twenty, and indeed shows but slight increase after the sixteenth year, the tables demonstrating that the pupil-distance is nearly the same in girls of from sixteen to twenty years of age as in women over twenty.

The length of this line in men and boys is, as was to be expected, greater than in girls and women, and moreover it does not reach a maximum at the age of twenty, but continues slowly to increase with the growth of the person concerned, a fact which coincides with the general laws of the growth of the two sexes.

In comparing the pupil-distance in the various refractive conditions, we see that (with exception of As, which furnishes remarkably high values) the greatest pupil-distance is found almost invariably in E. In M it is generally less than in E; in a few instances only is it greater. H shows without exception much smaller figures than M, a fact which is especially marked in Table V., although in Table III., where the average of larger numbers is given, there is an apparently greater pupil-distance (by 0.4 to 0.6 *mm.*) in H than in E. Nevertheless, in this same table the *average* pupil-distance in H is a trifle (0.5 *mm.*) shorter than in E (56.7 to 57.2). But in considering this fact we must not forget that H is chiefly marked in the youngest children, so that from the average size of the head, and average growth, it ought naturally to exhibit smaller figures than E, which is more evenly distributed amongst all the classes. In an opposite sense the same may be said of M; the only correct measurements to compare are those of children of the same age.

TABLE VII.

Increase of the pupil-distance in 61 girls during the space of four years.

Age.	12	13	14	15	16	17	18	Average Increase. Total.
E	6	4.3	5.3	5.4	2	4	2.5	4.9
	1	3	24	10	2	2	2	44
H	—	6	2	—	—	—	—	4
	—	1	1	—	—	—	—	2
M	—	6	4	5.3	3	2	2	4.1
	—	1	3	3	1	1	1	10
As	—	6	7	—	6	—	—	6.5
	—	1	2	—	1	—	—	4
1 Eye H	—	—	—	4	—	—	—	4
1 Eye M	—	—	—	1	—	—	—	1
Average	6	5.2	5.2	5.3	3.2	3.3	2.3	4.8
Total	1	6	30	14	4	3	3	61

The preceding table (VII.) shows the average increase of the pupil-distance in 61 girls, arranged according to their age and refraction, in order to establish, if possible by so meagre statistics, the age at which this increase chiefly takes place, and to discover whether the increase is more or less marked in the various degrees of refraction.

Inasmuch as this series contained only 4 H, we cannot lay any stress upon the influence of this refractive condition upon the increase of the pupil-distance. The 44 E show an average increase of 4.9 *mm.*, the 10 M of only 4.1 *mm.* The increase was most noticeable in the 4 girls with As, in two of which it amounted to 6 *mm.*, in the others to 7 *mm.* The increase is also most chiefly marked up to the age of fifteen, and amounted up to this age to more than 5 *mm.*; thence onward the increase was slighter. At the age of eighteen it is only one half as large as before, a result which coincides with the assertion previously made, *that the pupil-distance of girls reaches its maximum at about the age of* eighteen.

Erismann has published tables which in form correspond with ours, yet our figures do not agree with his. Nor is this to be expected, since there can be no question that the average length of the basal line varies just as much in different countries as the average height of their inhabitants. The great question, then, to establish is not so much the absolute length of this line, as its relative proportion; and, on the whole, the agreements are rather remarkable.

The same author gives the *average yearly increase as about* 0.5 *mm.*, but his figures do not exhibit such marked uniformity as ours. For, girls above fifteen years of age are not represented in his tables at all, while men show an increase up to their twenty-second year, but only of 0.1 *mm.* yearly after twenty. The H have a less average than the E and M, while on the contrary, and in opposition to our figures, his M have a longer basal line than the E, with but one or two trifling exceptions. Bjeloff,[1] however, coincides with us, asserting that the basal line in M is longer than in H and shorter than in E.

[1] Material zur Lehre von den Bedingungen des dynamischen Gleichgewichts, etc. Ref.: *C. f. A.*, Band v., p. 478.

Although Mannhardt[1] regards a long pupil-distance as characteristic of M, and refers it to the great disposition of myopes to insufficiency of the interni, and even thinks that there is a proportional relationship between these two conditions, our tables and those of Bjeloff throw considerable doubt upon this assertion, while those of Erismann render it especially improbable, because in the latter tables the difference between the pupil-distance of emmetropes and myopes is exceedingly slight.

The dynamic relations of the ocular muscles have never yet been carefully investigated. Many accurate examinations have been made of evident pathological alterations in the muscles, much has been written and published concerning strabismus and the insufficiency of the internal recti in M, but inasmuch as there is a great diversity of opinion concerning the etiology of these diseases, **it seemed eminently proper to undertake new investigations into the muscular relations of eyes that, so far as we could ascertain, were perfectly healthy.** Becker had already made similar observations, had tested many eyes according to v. Graefe's method of equilibration, and decided upon their maxima of abduction and adduction. For these and other reasons we were induced to undertake similar investigations while examining the vision of these school-girls. The experiments were made in the usual way, except that a rose-tinted prism was employed. A burning candle was first fixed at a distance of five metres, and if the double images did not stand directly above one another, the prism needed for correction was then employed and its angle noted. The same process was followed with a white dot on a black background, held at 30 *cm.* from the eyes. *For the sake of abbreviation: Far, Near, Equilibrium, Convergence, Divergence, will in the rest of the paper be indicated only by their initials* F, N, Eq, C, D.

Table VIII. shows the cases, arranged according to their refraction: first those with Eq; then those with preponderance of the externi, D; followed by those with preponder-

[1] Muskulære Asthenopie und Myopie.—*V. Graefe's Archiv*, Band xvii., Abth. 2, p. 69.

ance of the interni, C; and finally two rows in which D for F or N was united with C for the opposite distance N or F.

We examined 233 girls in 1879, 297 in 1883, but in the latter we have not included those examined four years before, in order that the same 61 might not be counted twice. Besides these we have included 256 persons examined previously by Dr. Becker, most of whom were out-patients in the hospital, a fact which may account for the preponderance of M, and the paucity of E. Cases of manifest strabismus are not included. We have consequently examined the following conditions of refraction:

	E	H	M	
1879	168	37	28	= 233
1883	195	79	23	= 297
Prof. Becker	50	88	118	= 256
	413	204	169	= 786

And these may be subdivided according to Table VIII.

We notice first of all how infrequently we meet with that which is regarded as the normal condition in which E exists for both F and N, or in which the elasticity of the abductors of the eyeball equals that of the adductors, a condition found in only 37 per cent. in E, 29 per cent. in H, 10 per cent. in M. We also see the preponderance of the externi over the interni in groups 2 to 6, and in groups 7 to 11 the opposite condition. Divergence is consequently much more frequent than convergence under each sort of refraction: 42 per cent. in E, 37 per cent. in H, and 59 per cent. in M. In cases of F and N with equal D, or of greater D for N than for F (groups 2 and 5), which are of more practical interest, the preponderance of M is still more noticeable.

In the same way, in groups 7 to 11 showing preponderance of the interni, we find for E 10 per cent., for H 28, for M 15, or, as was to be expected, a preponderance of C for H. Indeed the figures for H are greater than those of E and M united. The M would be still smaller if only the figures of the lower schools had been counted in, for in these with 51 M there was only one case of C, while in 118 older scholars there were 25 cases.

TABLE VIII.

RESULTS OF V. GRAEFE'S EQUILIBRATION TEST IN 786 PERSONS.

	Em			H			M			Total.					
										Em		H		M	
	1879.	1883.	Becker.	1879.	1883.	Becker.	1879.	1883.	Becker.	Total.	Per cent.	Total.	Per cent.	Total.	Per cent.
1. Equilibrium { F. N. .	47	93	15	10	22	27	4	8	6	155	37	59	28.9	18	10.6
2. Equal D. . { F. N. .	3	6	3	0	1	1	1	1	11	12	2.9	2	1.	13	7.7
3. Far Eq. Near D. .	46	36	6	7	17	11	9	6	13	88	21.1	35	17.1	28	16.6
4. Far D. Near Eq. .	4	9	6	1	4	6	0	1	5	19	4.6	11	5.4	6	3.5
5. { Far D. Near greater D. . .	28	22	6	6	15	7	8	6	39	56	13 5	28	13.7	53	31.4
6. Far D. Near less D.	0	1	0	0	1	0	0	0	0	1	0.2	1	0.5	0	0
7. { Far Near } Equal C.	6	2	0	1	5	6	0	0	0	8	1.9	12	5.9	0	0
8. Far Eq. Near C. .	2	3	3	1	2	2	0	0	2	8	1.9	5	2.4	2	1.2
9. Far C. Near Eq. .	5	9	7	4	9	18	0	0	18	21	5.1	31	15.4	18	10.7
10. { Far C. Near greater C. . .	2	1	1	1	1	5	0	0	2	4	0.9	7	3.8	2	1.2
11. Far C. Near less C.	1	3	1	2	1	0	0	1	3	5	1.0	3	1.4	4	2.4
12. Far D. Near C. .	1	0	1	2	0	2	0	0	1	2	0.4	4	2.	1	0.6
13. Far C. Near D. .	23	10	1	2	1	3	6	0	18	34	8.2	6	2.9	24	14.2
Total	168	195	50	37	79	88	28	23	118	413	100	204	100	169	100

F D, N C had only 2 E, 4 H, 1 M, while on the contrary F C, N D showed 14 per cent. in M, and about 3 in H.

To conclude:

(1) The equilibrium of the lateral muscles of the eyes is frequently disturbed in all conditions of refraction, *and not only in adults but in children of only five years of age.*

(2) The externi preponderate in all sorts of refraction in more than one third of all the cases, and in M in more than one half.

(3) The interni preponderate especially in H, in about 33 per cent. of all the cases.

Sixty-one of the girls were examined at four years' intervals, and it was found that the equilibrium of thirty-nine had not changed at all, twenty-three remaining either D or C as before, while sixteen showed unaltered Eq both for F and N.

There was but one case each in which Eq was changed into D, and *vice versa*:

$$\left.\begin{matrix} \text{F C } 5^\circ \\ \text{N D } 12^\circ \end{matrix}\right\} \text{ was changed into } \left\{\begin{matrix} \text{F D } 2^\circ \\ \text{N D } 3^\circ \end{matrix}\right.$$

$$\left.\begin{matrix} \text{F D } 3^\circ \\ \text{N D } 3^\circ \end{matrix}\right\} \text{ was changed into } \left\{\begin{matrix} \text{F C } 2^\circ \\ \text{N D } 6^\circ \end{matrix}\right.$$

Hence, to the above conclusions we can add: (4) Alterations of the dynamic relations are frequent in young people and may assume various types.

It is generally asserted that in youth the interni frequently preponderate, then yield as age increases, while finally the externi preponderate. Observations after squint-operations are well known. Thus, after convergent strabismus, we do not at once obtain increased preponderance of the externi, and Schweigger concludes, after seeing spontaneous cure of convergent squint, that the mutual relations of the muscles must have as spontaneously altered.

It would be agreeable at this point to discover how those cases act in which, at the same time, the refraction has altered. Thus, where M has developed or increased, has D developed from C or from Eq, or has it even increased from a previously slight D? Unfortunately, pertinent cases are too few in number for satisfactory statistics, yet we may venture at this point to cite some figures.

In twenty-seven cases of elongation of the globe, D increased very noticeably or developed in six cases, D remained as before in one case, Eq in two cases; C originated from Eq in two cases. I would, however, call attention to the fact, that although M may increase very noticeably, yet the interni do not always yield. Thus, in a case in which M had increased from ten Diop. in each eye to eighteen right eye and to fourteen left eye, Eq had continued as before. In another case D returned to Eq, although EM had been transformed into four Diop. M right eye, and three Diop. M left eye. While, finally, in fourteen cases in which the same amount of H had continued, C had increased from its original condition three times, D had decreased the same; in one case each D increased and C decreased.

It is asserted by some authors that the faulty action of the antagonistic muscles is frequently congenital. But it is almost impossible to bring any proof on this point, because it is so difficult to test the new-born. All that we can say is, that when such disturbances are early discovered, and when we can exclude all inflammatory, functional, or nutritive disturbances, we have the right to regard them as congenital. More accurate proof than this is impossible. But since we have carried our investigations back to the earliest possible age and have found the same abnormities as in adults, it is probable that these are congenital.

Bjeloff examined 216 persons in order to test the various refractive conditions for *latent* D and C. He arranged the tests for the same distance as we have done, the ametropes were tested both with and without correction, and his results in EM and uncorrected ametropia coincide with ours.

What now is the aim of these equilibrium experiments? V. Graefe tells us that the act of holding prisms before the eye causes double images, which the eyes endeavor to fuse into one when the two images lie horizontally to one another. But if one image lies above the other, the eyes do not endeavor, in the case of too strong a prism, to fuse the images, but yield to the elastic tension of their muscles. If the tension of the adductors equals that of the abductors we have dynamic equilibrium.

Alfred Graefe[1] doubts if the eyes always assume their position of rest in this experiment. He has seen cases in which the deviation thus produced was smaller than the real amount; but he never saw it greater. Still he acknowledges that wherever we thus discover this deviation the disturbance is not simulated but is genuine. In some cases it may be even more extensive than the experiment shows. It is, nevertheless, generally assumed that in a pair of eyes which we cause to look at a distance, and in which we then, with this experiment, find one image directly over the other, the sum of the elastic forces of the interni is equal to that of the externi, while in any other case this equilibrium is disturbed. But we are less concerned with the exact amount of this deviation, than with the fact that it really exists and indicates the preponderance of one group of muscles. It is a matter of indifference whether we here assume that (in vision to a distance) the motor nerve is entirely free from irritation, or whether, as Brondgeest has demonstrated on the muscles of decapitated frogs, a reflex irritation reaches the muscles through their own nerves. The latter is probable, and Hering believes in a continuous tonus dependent upon a steady innervation. And, at all events, if there is any innervation, its action must be equally distributed to both groups of muscles if equilibrium is present.

If we next consider the manner in which the various combinations (Table VIII.) originate, we have to separate two things: 1. During vision at a distance with a prism held before the eyes, accommodation is relaxed as much as possible, and the external ocular muscles are either innervated not at all or all alike. Six metres represent infinite distance, and can without error be substituted for the same. The visual lines can then be parallel or intersect one another in front of or behind the eyes. Eq, C, D. 2. If we then attempt the same experiment while fixing an object close at hand, or if, in other words, we accommodate for a point at a finite distance, the innervation of the externi and interni is altered. This innervation varies in every one: now the interni predominate, now the externi; or there may be no

[1] Graefe-Saemisch: Handbuch, Band vi., Abth. 4, p. 194.

alteration at all in the position of the eye, in which case, however, the innervation has not ceased, but is equally distributed amongst both groups.

If now, bearing these facts in mind, we examine the various cases, we find that with Eq for both F and N the innervation stands in a corresponding relation to the accommodation at every given distance.

In the second group the visual axes when prolonged backward cross one another behind the eye (D). The various subdivisions in this group depend upon the innervation caused by the act of accommodation, resulting now in Eq, and then again in D. The same happens under group three.

There is something curious about those cases in which with D for F we see C for N, and inversely. In these, Eq exists only for a determined distance. If the accommodation is arranged for this point the visual axes here unite. If the patient looks at a point farther distant D or C appears, or *vice versa*. Thus, in my own eyes: F, C 3°, for N, D 6°. By altering the distance of the object fixed, I find Eq for a distance of about one *m*.

We see, therefore: 1, *that the relation of the group of abductors and adductors in the position of rest varies largely;* 2, *that the alteration of the dynamic relations of the two groups ensuing upon accommodation is subjected to many individual variations.*

The disputed point in Donders' theory on the origin of convergent squint in H is this, that the relation between accommodation and convergence in H and M must be the same as in E. Donders says that the hypermetrope in fixing a near object is inclined to converge more strongly, since an increased convergence relieves his difficulty in accommodating. But since, so long as binocular single vision exists, the degree of convergence is decided by the distance of the object fixed, the hypermetrope occasionally renounces binocular single vision and converges more strongly, in order to accommodate with greater ease and to continue the act of accommodation for a longer period.

Schweigger[1] assumes that the relation between accommo-

[1] Klin.: Untersuchungen ueber das Schielen, Berlin, 1881.

dation and C in H is different from that in E, in point of fact a better one, for it is learned by experience, it is not congenital, and consequently must be developed differently in H than in E. He also thinks that we must look about for other causes of strabismus—*e. g.*, in a disturbance in the relations of the ocular muscles. If the interni predominate we have convergent strabismus, in other cases divergent; H being disposed to convergent squint in the same way as M to divergent.

Inasmuch as the above-mentioned variations occur fre quently in H, we have some doubt in agreeing with Donders that the accommodation is equally difficult for all hypermetropes of the same degree with equal convergence. For myself, I am disposed to believe that we ought to separate the various cases of H with relation to their disposition to convergent squint, according as the relation of the externi to the interni varies in different hypermetropes. If we, *e. g.*, take two cases of H, both with Eq for distance, yet the first has Eq for N while the other has well-marked C for N. After removing the prism, the first one will not need any exertion to obtain binocular fixation, for the visual axes already intersect at the fixed point. In this case, also, there will be no difference between the hypermetrope and an emmetrope with similar relations of the muscles, provided the muscle of accommodation acts normally, something that we regard as unconditional in a young person.

In the second case, the prism is removed, whereupon the externi must be innervated in order to bring the eyes into a correct position; and yet this very innervation disturbs the accommodation. If, on the contrary, the accommodation is sufficient, the eyes have a tendency to assume too convergent a position. In such cases, consequently, difficult accommodation must contribute directly to the origin of the convergent squint, as it really does in H. But the accommodation may be able to participate in this work even in emmetropes, and possibly in slight degrees of M. Nevertheless it is not always necessary that the accommodation should play a part. For the disturbance of equilibrium can from the first be so considerable, that even without the

co-ordination of accommodation the eyes are forced to assume a squinting position.

Finally, Table VIII. also shows that the preponderance of the interni is more frequently discovered in H than in other conditions of refraction. Frequent mention is made of the fact that H inclines to preponderance of the interni even without accommodation, but I never yet knew that this assertion had been at all supported by statistics.

Although the disturbed relations of the muscles are not regarded by Donders' followers as the primary cause of the origin of convergent squint in H, we may be permitted to suggest that the cause of convergent squint in any other sort of refraction than H is not to be sought for in a paresis of accommodation (more suspected than proved by Donders) in emmetropes, nor in a too excessive endeavor of convergence by myopes,[1] but in the dynamic muscular relations.

The previous table also exhibits the well-known tendency of M to insufficiency of the interni. Yet it must addionally be emphasized that E and H frequently exhibit a latent D (E 42 per cent., H 37, M 59).

The pathological insufficiency of myopes has, on the one hand, been referred to too great exertion of the interni, and, on the other, to a restricted capacity of rotation dependent upon elongation of the eyeball (Donders). But v. Graefe[2] is inclined to refer this condition to a predisposition of the muscles, probably hereditary, while Mannhardt embraces a view entirely opposite to that of Donders, and regards the insufficiency as the principal cause of M. With the latter, it will be difficult to make our statistics harmonize. Can any one believe that *fifty-nine per cent. of our myopic school-girls acquired their refraction by insufficiency?* If we grant this, we cannot say the same of the remaining forty-one per cent. According to Mannhardt, we ought to believe additionally that all of the E and H children who showed insufficiency must finally become myopic. Yet the improbability of such an idea is demonstrated by the tables of Becker, in which a large number of adults have escaped the danger of becoming myopic despite well-marked insufficiency.

[1] *V. Graefe's Archiv*, Band x., p. 156.

[2] *K. m. f. A.*, 1869, p. 34.

Now if, on the other hand, we shall, like Donders, refer all cases of insufficiency in M to the causes previously suggested, we shall be obliged to look about for some other explanation for the same affection in E and H. Do we now require a great degree of mental compulsion to believe that the disturbance of the muscular equilibrium, which results so unfavorably to the interni, is frequently congenital with all sorts of refraction, and that the increase of this disturbance to an amount which produces excessive annoyance is caused by conditions which are peculiar to myopic eyes alone? Grant this, and we can then easily agree with Donders, and accuse the elongation of the eyeball, the consequent difficulty of motion, and the over-exertion of the muscles thus produced, as the cause of the increased insufficiency in M.

Leaving aside, however, all theoretical discussions, the examination of the dynamic relations of the lateral muscles may be of some practical value. It appears to be useful not only to pay attention to any existing insufficiency of the interni or externi of which the patients may complain, but to obviate them if possible. For this reason, whenever we order a pair of glasses for patients at our clinique we measure the muscular relations, and if we discover any deviation for the distance of which the glasses are chiefly or exclusively employed, the distance at which the lenses are to be set is properly modified. Thus, if a myope shows convergence for distant objects, we note for the optician, not the real pupil-distance, but a distance from two to eight *mm.* less. With convex glasses the pupil-distance is increased in the same manner. I do not know how extensively this method has yet been followed, but I heartily recommend its adoption everywhere.

Besides determining the relations of the two chief muscular groups, we must fix the MAXIMA OF ABDUCTION AND ADDUCTION.

It has been objected that no value can be placed upon the results of this method, because the capacity for abduction and adduction can be increased by exercise. But I would reply that after any such exercise the mutual relation of these maxima remains precisely the same.

Prof. Becker has been able to confirm by his experiments on stereoscopic vision with divergent visual lines[1] that, despite the capacity of voluntary divergence which he had personally cultivated in a high degree, the previous dynamic equilibrium of the externi and interni remained the same as before. Even to this date the professor's eyes are in a state of equilibrium for all distances, a fact that can only be explained by assuming that the capacity for isolated contraction of the interni increases simultaneously with the forced and isolated innervation of the externi. In point of fact, the relative relation between abduction and adduction, both for distant and near vision, has equally remained unaltered.

I append another table (IX.), which shows the various dynamic conditions with reference to their range of fusion. The persons referred to are the same 250 (50 E, 88 H, 118 M) already arranged in Table VIII.

The average values for the maxima of abduction and adduction, as given in this table, do not precisely correspond with those of Alfred Graefe,[2] who appears to give too large estimates for adduction and too small estimates for abduction. They do, however, appear to agree very nearly with those of Reich[3]:

	Far.			Near.		
	Abd.	Add.	Abd.: Add.	Abd.	Add.	Abd.: Add.
Reich	5.	15.	0.33	15.	24.	0.62
Table IX., 1 { Far Eq / Near Eq } Em. .	6.2	13.2	0.47	11.5	20.2	0.57

Bjeloff also describes the relation between abduction and adduction as being about $0.50\mp$. Reich gives nearly the same figures.

In our cases with { F Eq / N Eq } this amounts:

	E.	H.	M.
for Far:	0.47	0.47	0.56
" Near:	0.57	0.57	0.71

and is consequently for F with E and H a little less than 0.50, for N a little more.

[1] Beitraege zur Lehre vom Sehen, etc.—*Sitzungsbericht der Wiener Akademie* (1861).

[2] Graefe–Saemisch, Band vi., Abth. 4, p. 41.

[3] *Nagel's Jahresbericht*, Band ii., p. 437.

TABLE IX.

RELATION OF THE MAXIMA OF ABDUCTION AND ADDUCTION TO THE RESULTS OF THE EQUILIBRATION EXPERIMENTS.

		Number.			Far.				Near.				Pupil Distance.	Number arranged according to age.				
				Per cent.	Eq.	Abd.	Add.	Abd. Add.	Eq.	Abd.	Add.	Abd. Add.		— 10	— 15	— 20	— 45	— 100
1.	Far Eq. / Near Eq.	E	15	30		6.2	13.2	0.47		11.5	20.2	0.57	58.9 *mm.*		1	2	5	7
		H	27	36		6.4	14 4	0.47		12.1	20.8	0.59	59.4		2	8	9	8
		M	6	5		8.2	14.3	0.56		15.3	21.3	0.71	55.8		2	2	1	1
2.	Far / Near } Equal D.	E	3	6	Div. 2.3	5	8	0.62	D. 2.3	10	20	0.5	55.6				1	2
		H	1	1	3	11	19	0.58	3.	20	25	0.8	59.		1			
		M	7	6	4.4	10.2	8	1.28	4.4	16.2	12	1.35	58.	1	1	1	4	
3.	Far Eq. / Near D.	E	6	12	Eq.	6.6	11.8	0.63	D. 3.8	11.6	15.8	0.73	59.8		1		2	3
		H	11	12		7	11.0	0.58	4.2	15.5	18.1	0.85	59.4		1	1	5	4
		M	13	11		6.7	12.8	0.53	4.7	15.6	12.7	1.23	57.6	1	2	4	5	1
4.	Far D. / Near Eq.	E	6	12	Div. 1.5	8.6	11.3	0.76	Eq.	13.8	19.8	0.69	60.2		1		2	3
		H	6	7	2.6	9.8	13.	0.76		16.3	17.6	0.92	58.8			3		3
		M	5	4	2.	7	12.2	0.57		17.2	16.6	1.03	58.2		2	2	1	
5.	Far D. / Near greater D.	E	6	12	Div. 2.8	7.7	10.3	0.75	Div. 6.5	14.2	15	0.95	60.5				3	3
		H	7	8	3.3	6.8	8.4	0.81	6.	14.3	14.3	1.00	59.8			1	3	3
		M	39	33	3.8	10.6	11.3	0.93	11.6	21.	18	1.6	57.2	2	7	8	11	3
6.	Far D. / Near less D.				Conv.				Conv.									

7. {Far / Near} Equal / Eq.	E																	
	H	6	7	2.5	7	18	0.38	2.5	9.2	21.2	0.43	56.4		1	2	3		
	M																	
				Eq.				C.										
8. {Far Eq. / Near C.}	E	3	6		7	12	0.58	2.3	9.3	18.6	0.5	59			1		2	
	H	2	2		7.5	10	0.75	3.	10.5	22	0.47	60			1		1	
	M	2	2		9	12	0.75	2.	16	12	1.33					1	1	
				C.				Eq.										
9. {Far C. / Near Eq.}	E	7	14	1.4	8	17.3	05		16.6	22	0.8	59				6	1	
	H	18	20	2.	6.3	14	.045		10.8	20	0.5	57		5	3	10		
	M	18	15	2.7	7.2	13.7	05		15	15	1.0	58	1	2	5	9	1	
				C.				C.										
10. {Far C. / Near greater C.}	E	1	2	2.	6	11	0.54	6	12	1.6	0.75	60					1	
	H	5	6	2.3	6	16.4	0.37	3.8	14.6	21.4	0.68	56		1	1	2	1	
	M	2	2	1.5	7.5	16.5	0.45	3.	10	27	0.37	57				1	1	
				C.				C.										
11. {Far C. / Near less C.}	E	1	2	3				2									1	
	H																	
	M	3	2	7.7	4.3	22.7	0.18	1.7	11	21	0.5				1	1	1	
				D.				C.										
12. {Far D. / Near C.}	E	1	2	2.	16	10	1.6	6	16	30	0.53	63					1	
	H	2	2	3.5	9	11	0.82	4	20.5	18	1.14	59			1	1		
	M	1	1	1.	13	15	0.86	1	15	15	1	57				1		
				C.				D.										
13. {Far C. / Near D.}	E	1	2	2	6	10	0.6	5	18	18	1	56		1				
	H	3	3	2.3	5	14	0.35	2	13	20.7	0.63	59				2	1	
	M	18	15	2.7	6.7	14.6	0.46	4.1	15.6	15.3	1.	59.2		4	1	11		

The influence of the dynamic preponderance of one group of muscles over another shows itself during the determination of the maxima of abduction and adduction in this way: If the interni are insufficient the maximum of abduction increases, and *vice versa*. In the first case the relation of the maxima is larger than 0.50, and may even pass beyond 1.00 up to 1.60 in M for N with $\left\{\begin{matrix} \text{F D} \\ \text{N greater D} \end{matrix}\right\}$; in other cases it is smaller, *e. g.*, 0.38 in H for F where the eyes for $\left\{\begin{matrix} \text{F} \\ \text{N} \end{matrix}\right\}$ show equal C. For N, this figure is larger in all the columns than for F.

Table IX. also exhibits the average length of the basal line, but it does not seem to be dependent upon any particular sort of refraction. Bjeloff asserts that the greater the pupil-distance, the greater the chance of discovering insufficiency of the interni, and of its higher amount. But our table does not show this. For (group 5) 39 M with $\left\{\begin{matrix} \text{F D} \\ \text{N greater D} \end{matrix}\right\}$ have an average pupil-distance of 57. 2 *mm.*, while (group 9) 18 M with $\left\{\begin{matrix} \text{F C} \\ \text{N Eq} \end{matrix}\right\}$ have a pupil-distance of 58 *mm.*, or, in other words, exactly the opposite from what one would suppose according to Bjeloff. It does not seem to me that there are any decisive results to be attached to the basal line. *The only point that we have so far discovered is, that hypermetropes generally show a less distance between the pupils than emmetropes and myopes of the same ages.*

ON RESECTION OF THE OPTIC NERVE.

By Prof. C. SCHWEIGGER, in Berlin.

Translated by Dr. A. Schapringer, in New York.

DIVISION of the optic nerve, as a substitute for prophylactic enucleation of the eyeball, was first proposed by Von Graefe,[1] who based his proposal on the theory that sympathetic disease travelled along the commissura arcuata anterior of the chiasm. This theory, however, was speedily superseded by that formulated by H. Müller,[2] who thought that it was more probable that the sympathetic irritation was transmitted by way of the ciliary nerves. He was led to this conclusion by the fact that in many cases of irido-chorioiditis he found complete atrophy of the optic nerve, extending from the retina to the trunk, not a single fibre with double outlines being left, whilst the ciliary nerves had remained normal. The theory that these nerves were at the bottom of sympathetic trouble had already been advanced by Arlt[3] as long ago as 1853.

As a natural result of this theory endeavors were made to substitute the operation of cutting the ciliary nerves for that of enucleating the injured eyeball in order to prevent sympathetic ophthalmia. Rondeau proposed early ciliary neurotomy in 1866,[4] and said: "Nothing is easier than this operation, which I have repeatedly performed on the cadaver. A small opening is made in the upper inner aspect of the

[1] *Von Graefe's Arch.*, Bd. iii., p. 454 (1857).

[2] *Von Graefe's Arch.*, Bd. iv., 1, p. 368.

[3] "Krankheiten des Auges," Bd. ii., p. 50.

[4] Thèse de Paris: Des affections oculaires reflexes et de l'ophthalmie sympathique.—*Annales d'ocul.*, 1879, vol. lxxxii., p. 229.

conjunctiva; through this a narrow curved tenotome is introduced, with which the ciliary nerves, the optic nerve, and the ciliary arteries can be cut at one stroke."

Von Graefe suggested cutting a portion of the ciliary nerves within the sclerotic, and his suggestion was carried out by Meyer.[1]

It is worthy of remark that Von Graefe did not deem it feasible to preserve the eyeball if all the ciliary nerves were cut on the outside of it. In one case, in order to relieve the patient of annoying subjective phenomena of light and colors, he performed neurotomy of the optic nerve by introducing a suitable instrument along the outer walls of the orbital cavity to its apex, and severing the nerve near the foramen opticum.

In 1876 Boucheron[2] revived the idea of cutting the optic and ciliary nerves instead of removing the globe. He described the operation as follows: "An opening is made into Tenon's capsule between the external and superior recti muscles, at a distance of about one *cm.* from the cornea, by means of a pair of curved scissors; the eyeball is grasped behind the cornea by a pair of stout mouse-toothed forceps, and pulled forward in order to put the optic nerve on the stretch; this is then cut, as well as the ciliary nerves and arteries. In order to make sure that none of the ciliary nerves have escaped the scissors, the opening of the conjunctiva and Tenon's capsule is enlarged, and the globe is rotated so as to bring its posterior surface with the optic and ciliary nerves into view." Boucheron performed this operation on a patient, but owing to conditions which did not invalidate the principle of the operation, the case did not prove a success, and was published only in 1879 in a thesis by M. Redard.

Schoeler was the first to practice neurotomy of the optic and ciliary nerves methodically and in a considerable number of cases.[3] His method differed from that of Boucheron

[1] *Annales d'ocul.*, 1867, vol. lviii., p. 129.

[2] "Note sur la résection des nerfs ciliaires et du nerf optique de l'œil substituée à l'énucleation du globe oculaire dans le traitement de l'ophthalmie sympathique."—*Gaz. méd. de Paris*, 1876, and *Annales d'oculist.*, vol. lxxvi., p. 238.

[3] See the *Jahresbericht* of his Ophthalmic Institute, Berlin, 1878.

in so far as he divided the external rectus muscle, securing it by a thread of catgut in order to re-attach it to the eyeball at the close of the operation.

In a paper published a short time afterward I pronounced myself in favor of a similar procedure,[1] with this important difference, however, that I do not merely divide the optic nerve, but I excise a piece at least ten millimetres long.

I have become convinced, through a long series of experiments, that an exsection of such an extent is not feasible by operating on the temporal side of the globe, but, for obvious anatomical reasons, it is an easy matter, after entering the orbital cavity on the nasal side, to divide the optic nerve far behind the eyeball, then to rotate the latter, and cut off the stump of the nerve near its insertion into the sclerotic coat.

In consequence of the deeply rooted prejudice in favor of enucleation, optic neurectomy has as yet found few friends only. Objections have been raised to it which call for discussion. It is urged that in many cases where neurectomy had been performed, enucleation had to be resorted to subsequently. Now, I would ask: Under what circumstances must an eyeball be enucleated? In most of the cases brought forward, the operation was probably done from fear that neurectomy did not guarantee immunity from sympathetic ophthalmia. When is such fear justified? There can be no doubt that we are never able to foretell with certainty whether sympathetic inflammation will supervene or not. If we take into consideration the great number of atrophic eyeballs due to injury that we meet, where sympathetic trouble never took place, though all the conditions favorable to its excitation were present, we must come to the conclusion that sympathetic ophthalmia very rarely develops in cases where it appears to be threatening. In many instances in which I advised enucleation, my advice was not followed, yet no harm ensued.

It is commonly supposed that there is special danger in cases where the ciliary region is sensitive to the touch. This fear I do not share. Tenderness of the ciliary body is

[1] *Berliner klin. Wochenschr.*, 1878, No. 20.

present in almost every case of irido-chorioiditis or uveitis, and we meet with a great many shrunken eyeballs, with tenderness of the upper portion of the ciliary region of long standing, which have never induced any trouble in the fellow eye. It is remarkable that the tenderness is always confined to the upper part of the ciliary body.

Besides this, there is a group of symptoms called those of sympathetic irritation, as photophobia, asthenopia, lachrymation, and congestion of the conjunctiva, which are regarded as precursors of inflammatory processes, and therefore as indications for enucleation. These symptoms, if met with in individuals whose eyes are otherwise normal, are looked upon as trifling, and are usually treated by applications to the conjunctiva merely; but if the person who complains of these symptoms happens to be one-eyed, then it is quite a different thing—it is sympathetic irritation, and the eyeball "must" be enucleated. If one eye has been lost, the spectre of sympathetic irritation lurks in every corner. This fear is baseless in most of the cases, as can be exemplified by the very instances of sympathetic neurosis which have been best authenticated, and which, notwithstanding their long duration, never turned into inflammatory processes.

With an incredible want of discrimination, nearly every thing which can happen to an eye has been described as sympathetic trouble, if it occurred in patients who had one atrophic eyeball. We need not enter into any details, since a great deal of light has been thrown lately upon the pathology of our subject by the investigations of Knies and Deutschmann upon the transmission of inflammatory processes by way of the lymphatic vessels of the optic nerves. These are in accordance with clinical facts. It is probable that the path of disease is formed not only by the lymph-vessels of the optic-nerve trunk and the subvaginal space, but also by the supra-vaginal lymph-space, which communicates with the arachnoidal space on one hand, and with Tenon's space and the perichoroidal lymph-space on the other,—but this has to be proved yet by experiments. Whether the inflammation is caused by a chemical substance, or by micro-organisms, is immaterial.

The theory of the propagation of sympathetic inflammation by way of the ciliary nerves has never been supported bo proof, and has always been a mere hypothesis. In natural philosophy a hypothesis is justified as long as it is capable of explaining the causal connection of facts, and serves as an incentive for new investigations. If an hypothesis fails to explain new facts brought out in the progress of investigation, and proves sterile as regards such investigation, it is in a bad way; but when it ceases to do any thing else but engender new hypotheses, it is time that it should be demolished. Let us leave the ciliary-nerve doctrine to those dogmatists who believe that a statement is sufficiently substantiated by the fact that they believe it to be true. If we stick to the anatomical and experimental facts, we are obliged to draw the practical conclusion that enucleation ought to be replaced by neurectomy. It is not necessary to remove the exciting eyeball, if by exsection of a piece of the optic nerve we can remove the bridge by which the inflammatory process may travel from the injured to the non-injured eye.

I claim that a neurectomy properly performed is a better protective than enucleation. Not a few cases have been published in which the second eye, which was perfectly sound at the time the enucleation had been performed, nevertheless became a victim of sympathetic ophthalmia subsequently. I will cite only a few of the best authenticated observations: Mooren,[1] one day after enucleation; Schmidt-Rimpler,[2] four days after enucleation; Pagenstecher,[3] nine days after enucleation, and resulting in blindness; Steinheim,[4] on the second day after enucleation, also resulting in blindness. Knies[5] has published a case occurring in the practice of Horner, in which sympathetic inflammation made its appearance as late as three weeks after enucleation, resulting in complete loss of sight. In a case

[1] "Sympathische Gesichtsstoerungen," p. 85.

[2] *Klin. Monatsbl. f. Augenheilk.*, 1874, p. 179.

[3] Pagenstecher u. Genth: "Atlas der path. Anat. d. Auges." Explanatory notes to Taf. xxxviii., Fig. 12.

[4] *Archiv. f. Augenh.*, Bd. ix., p. 46, etc.

[5] "Ueber sympathische Augenerkrankung" (Festschrift), p. 66. Wiesbaden, 1881.

of Critchett's [1] it supervened fifteen days after enucleation, and resulted in nearly complete destruction of sight; in one published by Wood White [2] it appeared on the fifth day; in three cases published by Nettleship,[3] on the twenty-second, twenty-third, and twenty-fifth days; in the case of Bowers [4] on the seventeenth, and in that of Snell [5] on the thirty-second, day after enucleation. I cannot understand how under these circumstances enucleation can be lauded again and again as the "only sure" method.

The occurrence of sympathetic ophthalmia after enucleation has been performed is entirely incompatible with the ciliary-nerve theory. The supposition that the action of cicatricial contraction upon the stumps of the ciliary nerves caused the sympathetic trouble in these cases is untenable on its face, for cicatricial contraction takes place in every case of enucleation. Besides, in the few cases in which a cause of irritation of the ciliary nerves in the orbit after enucleation could be demonstrated, this did not cause sympathetic inflammation, but only nervous irritation of the fellow eye, as for instance in the case of Salomon,[6] in which the same symptoms of irritation which had furnished the indication for enucleation recurred when an artificial eye was worn.

If we consider that in no case of preventive enucleation it can be positively asserted, either before or after the operation, that sympathetic inflammation would have supervened if enucleation had not been performed, and if we therefore have to concede that it actually would have supervened only in a small minority of the cases, we must draw the conclusion that a few well-authenticated cases in which sympathetic inflammation occurred in spite of preventive enucleation have more influence in determining the facts than several peckfuls of eyeballs removed for safety sake.

[1] *Ophth. Hosp. Rep.*, vol. x., p. 322.

[2] *Brit. Med. Jour.*, 1881, p. 596.

[3] *Transactions of the Clin. Soc. of London*, vol. xiii., 1881.

[4] *Brit. Med. Jour.*, 1883, p. 1,000.

[5] *Transact. Ophth. Soc. of the United Kingdom*, vol. ii., p. 19. On p. 21 another case is brought forward by Frost.

[6] *Dublin Quarterly Jour.*, vol. xxxv., p. 58.

This is not an exaggerated expression, for Alfred Graefe[1] for instance, reports that in his practice "the ratio of enucleations (excluding those which were performed on account of tumors) to the number of patients was about ½ per cent. during the years 1860 and 1861, and about 1½ per cent. during the years 1880 and 1881," in the latter instance one enucleation occurring among every sixty-six patients. In my own practice the ratio of enucleations, including tumors, is only 0.5 pro mille, and that of neurectomies not more than two to three pro mille of the whole number of patients.

We can easily explain the occurrence of sympathetic inflammation after preventive enucleation, if this was performed late, so that the inflammatory process had had time to advance far in the lymphatic spaces. Under such circumstances the sympathetic inflammation will attack the other eye at the same time as it would have attacked it if no enucleation had been done. For this very reason it is necessary to divide the optic nerve as close to the foramen opticum as possible. Already four years ago I pointed out the necessity of removing at least ten millimetres of the optic nerve.[2] In performing enucleation the nerve is usually divided close to the eyeball. If the portion of the lymph-spaces remaining in the orbit be already diseased, the inflammatory process will go on the same as if enucleation had not been carried out. Of course, this can also happen after neurectomy, and I do not doubt that sympathetic inflammation may occur for several weeks after it. If we want to prevent extensive involvement of the lymph-spaces, we must operate early, and if we have to insist upon an early operation, neurectomy will certainly be found more acceptable than the disfiguring operation of enucleation.

Leber[3] has published a case in which so-called sympathetic inflammation occurred two years and a half after neurotomy had been performed, and S. C. Ayres[4] one in which it came on one year after enucleation. Both were

[1] Naturforscher-Versammlung zu Magdeburg, 1884.

[2] "Handbuch der Augenheilkunde," fourth ed., 1880, p. 369.

[3] *Von Graefe's Arch.*, vol. xxvii., 1, p. 340.

[4] These ARCHIVES, vol. x., p. 199.

instances of serous iritis, which has the same appearance whether it be of sympathetic origin or not. If one eyeball happens to be shrunken, it does not follow that serous iritis, developing in the other after a long interval has elapsed from the time of the original injury, is necessarily due to sympathy. As regards the case of Leber, one circumstance was wanting, to which Leber himself attaches great importance (see p. 333, *l. c.*), and justly. If the first eye has been atrophied for some time, we have no right to attribute to sympathy any inflammation of the uveal tract in the second eye, unless some renewed inflammation occur in the primary eye at the same time. In the case of Ayres something of this kind took place, as there was pain around the stump of the optic nerve; in that of Leber, however, the atrophic eyeball was hard and the region of the scar somewhat tender, but there was no trace of inflammation. According to my view the sympathetic nature of the uveitis has not been proven in either case, but if it be assumed for either one, it must also be conceded for the other, as well as for a third case published by Lawson,[1] who observed the development of well-marked and far-advanced sympathetic inflammation nine years after enucleation.

Properly speaking, I need not take Leber's case into consideration at all, since he performed only optico-ciliary neurotomy, merely dividing the optic nerve, whilst I claim that only the exsection of a piece at least ten millimetres long can be relied upon as a safe preventive measure.

Another objection that has been raised is that divided nerves are regenerated. It is not at all surprising that the ends of a nerve which has been simply cut through will reunite, but I will deny the possibility of regeneration if a piece ten *mm.* long has been exsected from the optic nerve until it shall be demonstrated as a fact. As regards the ciliary nerves I know very well that sensitive nerves are regenerated to an incredible degree, but then the theory that the ciliary nerves have any thing to do with the causation of sympathetic inflammation has been exploded. Besides, I have met with complete anæsthesia of the cornea after

[1] *Ophth. Hosp. Reports*, vol. x., p. 3.

complete denudation of the posterior circumference of the globe in very few cases, some peripheric portions usually retaining sensitiveness, and in none of the cases which I examined one or two years after the operation had the cornea fully regained sensitiveness, as could be easily demonstrated by comparison with the other eye.

It is interesting to note the behavior of the motor fibres of the ciliary nerves. If the operation be performed in a case with normal iris the effect is mydriasis ad maximum, so that atropia has no further influence. Eserine, however, will produce marked myosis, except in such cases in which the drug could not have produced any effect before the operation, as for instance in glaucomatous mydriasis. From this reaction to the influence of eserine no inference can be drawn as to the regeneration of the motor nerve fibres; besides, no contraction of the pupil can be produced by the entrance of light into the other eye.

The objection urged against neurectomy, that it causes atrophy of the globe, is baseless. It is well known that irido-chorioiditis can produce atrophy, and it ought not to be expected that neurectomy will prevent atrophy. I have not seen that atrophy occurred oftener after neurectomy than without it. On the other hand atrophy does not occur if the disease which necessitated neurectomy does not cause it. For instance, I have never seen atrophy follow if neurectomy was performed on account of violent pains in eyes with absolute glaucoma.

In two cases I noted changes in the other eye after neurectomy and I therefore publish them here.

Case 1.—Anna B., æt. twenty. Her right eye was attacked by inflammation a year ago; the attack has recurred repeatedly. When admitted, July 21, 1881, a violent inflammation had been existing for three weeks. Her condition was as follows:

Right Eye.—Eyelids slightly red and swollen and kept closed most of the time. Entire circumference of pupilliary margin adherent to lens capsule, nodular protrusions of periphery of iris. Iris discolored, showing several dark specks. Ciliary region tender to touch. Violent pains in eyeball and entire right half of head as far as occiput. Tension slightly diminished, S=o.

Left Eye normal; M $\frac{1}{40}$, S $\frac{6}{6}$.

Neurectomy of right eye was performed July 21st. On July 22d moderate pain in right eye, headache completely gone.

August 2d. S of left eye diminished to $\frac{1}{3}$ or $\frac{1}{2}$, reads 0.4 at a distance of 20 *cm.* with difficulty. Field of vision complete. Outlines of optic disc blurred; its area, as well as that of surrounding portions of retina, opaque, grayish, and swollen. Vessels markedly curved, partially hidden by exudation. Small hemorrhage to the medial side of disc.

Ordered: Salicylate of soda as a diaphoretic. At the expiration of a week S was found to have markedly improved; the opacity and swelling of the retina disappeared slowly and were gone at the end of four weeks. She was discharged with M $\frac{1}{40}$, S $\frac{6}{6}$.

I saw her again in October, 1883, two years after the operation. The right eye had remained free from relapse; there was no atrophy, but the sensibility of the cornea was considerably less than that of the other eye. The fundus of the left eye was normal, S the same as last noted.

Case 2.—Marie W., æt. twenty-seven, several years ago suffered from a painful inflammation of the right eye, which caused blindness, and was followed by several severe relapses. Of late she has been troubled with photophobia, lachrymation, and asthenopia of the left eye.

Condition on June 26, 1882. *Right Eye:* Pericorneal injection, cornea clear, anterior chamber shallow, periphery of iris bulging, pupillary margin completely adherent to lens capsule, yellowish-gray exudation in pupillary space, tension diminished. *Left Eye* normal, S=1.

June 27th. Exsection of right optic nerve.

July 5th. Outlines of left optic disc somewhat blurred, its area, as well as that of surrounding portions of retina, somewhat swollen, vessels tortuous, partially covered by exudation, S not diminished, being =1.

The ophthalmoscopic changes disappeared in the course of four weeks, the same as in the previous case, S remaining normal all the time.

Notwithstanding the large number of neurectomies performed I have not met with other similar cases. These phenomena might properly be ascribed to sympathy, since the causal relation appears to be well established, and

the probable path of propagation can be pointed out. There is no more bleeding in neurectomy than in enucleation, but in the latter operation the blood is drained off freely, whilst in the former it is kept back in the orbital cavity since the eyeball is replaced and the conjunctival wound sutured, and from there it is diffused into the surrounding tissues. The lids of the other eye are very often found to be bloodshot a few days after neurectomy has been done, an ecchymosis under the skin of the bridge of the nose indicating the way the blood had travelled. The subvaginal lymph-space of the stump of the optic nerve is to be regarded as a preformed path for the diffusion of the extravasated blood. A small quantity of the latter may thus be carried as far as the arachnoidal lymph-space, to be absorbed there after a short time without giving rise to any symptoms. But it is also possible for the extravasated blood to reach the subvaginal lymph-space of the other optic nerve by way of the chiasm and to occlude it temporarily by coagulation. The consequence would be lymph stasis in the optic nerve and the retina, the ophthalmoscopic picture of which in other intracranial processes we are so familiar with. Choked disc, as it occurs in cases of tumor of the brain, etc., is certainly produced in many instances in a similar way, viz., by lymph stasis in the optic nerve and the retina, caused by the increased intracranial pressure preventing the outflow of lymph from the subvaginal space.[1] In such cases the visual power is usually little interfered with, the same as in the two cases detailed above. It is not difficult to find an explanation for the fact that these ophthalmoscopic changes do not occur oftener, since the orbital hemorrhage need not enter the subvaginal space every time, as it cannot if the space be occluded by pressure from without. Besides, if the blood does penetrate there, the chances are more in favor of its reaching the subarachnoidal space, where it will be absorbed without causing any appreciable symptom than of its clogging the lymph-space of the other nerve. Nevertheless, the latter contingency is not impossible.

[1] See my "Handbuch der Augenheilkunde," fourth edition, p. 506.

The same holds good of sympathetic inflammations. An inflammatory process, starting from the damaged eye and proceeding by way of the lymphatic spaces, may there exhaust itself before reaching the arachnoidal space, and if it does reach it, it is at least as likely that it will run its course there without producing any symptoms, as that it will penetrate the lymph-spaces of the other eye. Thus it can be explained why sympathetic inflammation happily occurs so rarely in cases where the injured eyeball fulfils every condition which is known to be capable of starting it.

In operating, I proceed in the following way: After an opening has been made into the conjunctiva and Tenon's capsule, at a distance of about three millimetres behind the insertion of the internal rectus muscle, this muscle is laid bare, and two slightly curved, blunt, but knobless strabismus hooks are introduced beneath it. These hooks being drawn into opposite directions, one will be caught in the angle of insertion of the tendon and tend to roll the eyeball outward, whilst the other will draw the muscle forward out of the orbit. Near the latter hook a catgut thread is passed through muscle and conjunctiva, first from within outward, and then the opposite way. The muscle is now divided at a distance of at least five millimetres from its insertion into the sclerotic, and the ends of the catgut thread are united into a knot. A second thread is passed through the terminal stump of the muscle, and similarly bound into a knot. The wound is now extended both toward the superior and the inferior recti muscles, and a small pointed double hook inserted into the sclerotic as far back as possible, in order to draw the globe forward and outward. A pair of scissors curved on the flat are introduced alongside of the globe, and the optic nerve, which can be easily felt, since it is put on the stretch, is cut through as near the optic foramen as possible. The posterior aspect of the globe can now be exposed to view by means of the double hook, the optic-nerve stump remaining on the eyeball is cut off near its insertion into the sclerotic, the insertions of the oblique muscles are divided, and the whole posterior circumference of the sclerotic bared by dissection. Afterward, the eyeball is

replaced, the wound closed by means of the catgut threads previously introduced, and the lids stitched together by three silk sutures. The last is done as a precaution against the development of sanguineous exophthalmos, which disagreeable complication had best be avoided. There is no more danger of its forming after the lapse of four days, when the stitches can be removed. They usually have cut through by this time, either in the upper or the lower lid.

The operation looks very formidable, the eyeball being almost completely enucleated and remaining in connection with the recti muscles and the conjunctiva only. Nevertheless, the consequences of the operation are very slight, and scarcely a vestige can be found after healing.

In some exceptional cases I have had occasion to operate on such eyes where an ophthalmoscopic examination was still practicable. The retinal vessels then appeared to be completely bloodless except on the disc, as far as its margin, where they contained a small quantity of blood, furnished probably by anastomoses with the choroidal vessels. The ophthalmoscopic appearances of the choroid, on the other hand, were not changed at all. I need scarcely add that opthalmoscopic examination becomes possible only after the lapse of a sufficient space of time during which collateral circulation in the ciliary vessels could be established.

The indications for prophylactic neurectomy of the optic nerve are of course the same as those for enucleation. The operation ought to be performed as early as possible, and only upon sightless eyes. Neurectomy while as efficient a prophylactic measure as enucleation, has the great advantage that it neither sacrifices the eyeball nor renders an artificial eye necessary. Patients will therefore more readily submit to it than to enucleation. Persons with enucleated eyeballs always insist upon wearing artificial eyes, because an empty orbit is a disgusting sight, and only those suffering from enucleating mania will question the good taste of a patient who prefers even an atrophied eye ball to an empty orbital cavity. Apart from the general inconvenience connected with artificial eyes there are many cases in which they cause traumatic conjunctivitis, and are not tolerated at

all. Besides, most of the injuries which threaten to be followed by sympathetic ophthalmia occur among the laboring classes, among whom the expenditure for an artificial eye, which has to be renewed at certain intervals, becomes an onerous tax.

The choice between enucleation and neurectomy may be difficult in case of a foreign body being lodged in the eye, but even then the preventive action of neurectomy will be equal to that of enucleation, and the latter operation will not be absolutely necessary. It is well known that foreign bodies can become encapsuled in the fundus, and sight may remain good, though as a rule they cause blindness by irido-chorioiditis. After the latter has run its course, the eyeball often remains quiescent, as can be seen in many cases presenting themselves at the dispensaries. But foreign bodies may also produce repeated attacks of inflammation. If a fresh case presents itself, it is impossible of course to foretell which course it is destined to take, and I therefore deem it best to explain the matter to the patient, and to make him choose between enucleation and neurectomy. I have seen eyes remain quiescent for years after I had performed neurectomy. If, nevertheless, subsequent enucleation should become necessary on account of painful attacks of inflammation, it can be performed without any difficulty.

Neurectomy is especially indicated in cases of injury by perforating grains of shot, where enucleation should be kept in reserve, because it happens often that the shot traverses the globe completely, and becomes lodged in the orbital tissue. Under such circumstances the appearance of a perforating wound of the sclerotic may lead us into the error of diagnosticating the presence of a foreign body within the globe, when the latter, in fact, is outside of it. Sometimes it will be possible to recognize the fact that a grain of shot has traversed the eyeball and has become lodged in the tissue of the orbit, as for instance in case 3.

Case 3.—Mr. W., while hunting on Nov. 18, 1878, met with an injury to his left eye, caused probably by a grain of shot ricocheting from a rock. An operation was performed soon

afterwards (excision of prolapsed iris ?), and ice and atropia applied.

I first saw the patient on November 24th, and found the point of entrance in the lower portion of the corneal limbus. The conjunctiva of the globe was very red, and its lower half so much swollen that it protruded between the lids. The anterior chamber contained some blood. Cornea and lens clear, pupil moderately dilated, no iritis, fundus not visible. Slight quantitative perception of light, since only a bright lamp could be made out. Pains which had been strong, have moderated. The presence of exophthalmos led me to the supposition that the shot was not lodged within the globe, but outside of it in the orbital space. I did not see the patient again until February 23, 1879. The cornea then was clear, and there was an anterior synechia in the cicatrix. Lens clear, dense opacities in vitreous, conjunctiva injected, ciliary body tender.

Neurectomy performed on February 27th. When the globe was rolled outward, some fatty tissue was found adherent to its posterior aspect, which contained the shot. A black dot below, and to the outer side of the optic-nerve entrance, marked the point of exit.

The wound healed without any trouble, and the other eye had remained normal until the present time, being six years after the operation.

In regard to the effect of neurectomy upon sympathetic neurosis, I will relate the following case:

Case 4.—Mrs. H., æt. forty-five, was admitted to our wards on May 30, 1882, on account of double cataract. *Right Eye*, $S = \frac{1}{15}$. *Left Eye:* Lens completely opaque, movements of hand at one metre. June 1st, peripheric extraction of left lens. After iridectomy the lens is found to be dislocated downwards, and has to be extracted by means of a platinum-wire loop. Healing normal. Discharged June 28th, with $H = \frac{1}{4}$, $S = \frac{6}{15}$, reads 0.4 with $+ 2\frac{1}{2}$.

In February, 1883, the patient returned to have her right eye operated upon, with which she now could only make out motions of the hand at a distance of one metre. February 8th, extraction of right cataract, operation smooth. The eye did well during the following four days, but then irido-chorioiditis set in, with hypopyon, discoloration of the iris, and masses of exudation behind it.

The eyeball grew smaller, and she was discharged March 15th. Returned June 19th. Has had pain occasionally in her right eye, notably on pressure. Also complained of dazzling, and of a blue sheen before the left eye. Right eye slightly injected, somewhat smaller and softer than the left; cornea a standing oval, transparent. The scar from the operation sunken, and somewhat congested. Anterior chamber narrow, iris yellowish-green (the left iris being blue), pupillary space being obstructed by a yellowish mass. Perception of light, but no projection. Left eye normal, with $+\frac{1}{4}$, $S = \frac{6}{18}$, reads 0.4 at 20 *cm.*, with $+ 2\frac{1}{4}$. On June 20th neurectomy was performed upon the right eye. On June 24th the patient stated that the "blue sheen" before the left eye had disappeared. Discharged July 3d.

The immediate disappearance of photophobia and the subjective sensation of light after the operation of neurectomy, proves that these phenomena were of sympathetic origin—and would enucleation have accomplished more? Whether the reflex irritation had travelled by way of the ciliary nerves or the optic-nerve fibres I will not attempt to decide. The latter was certainly possible, since the patient had quantitative perception of light in the eye operated upon, proving that the optic nerve still contained fibres of unimpaired conductibility.

But under all circumstances the transmission of an inflammation from one eye to the other is accomplished in quite a different way from that of a reflex neurosis, and Mooren[1] is mistaken in contradicting the universally recognized fact, that sympathetic *inflammation* never occurs before the lapse of from three to four weeks after injury of the other eye, substantiating his view by the fact that reflex *neurosis* has been observed at a much earlier period.

The sympathetic character of a neurosis can be established only by its disappearance after enucleation or neurectomy. If the neurosis subsides only gradually in the course of a few weeks after the operation, the question whether *post hoc* or *propter hoc* would be difficult to decide. Observations of a considerable series of similar cases are evidently necessary to enable us to form intelligent conclusions. But if enucleation

[1] "Fünf Lustren," Wiesbaden, 1882, p. 147.

has no effect upon the neurosis, then I consider it proved that the trouble was not of sympathetic origin. If this is not conceded, then every thing that may happen to one eye after injury to the other will have to be ascribed to sympathy, which is a simple thing to do, but which, under certain circumstances, may involve serious consequences. In order to elucidate this, and also to show a specimen of the reckless speculation prevalent in the literature of this subject, I will quote the following passage :[1]

" Subjective sensations of light have been rarely met with. These phenomena should not be ascribed to sympathy, but to central irritation. Prof. Alfred Graefe on one occasion informed me that he was compelled to enucleate an eyeball one year after an injury and *while sight was almost perfect*. The other eye was completely normal. At last accounts, which was six months after enucleation, the photopsiæ continued unabated, and caused so much suffering that fears were entertained about the patient's life. At the microscopic examination made by Th. Leber a fragment of a gun-cap was found firmly adherent to the ciliary body. The latter was otherwise normal, only the adjacent portion of the pars ciliaris retinæ being thickened. A small adjoining portion of the vitreous was infiltrated with pus. Nothing more was found except hyperplasia of the intraocular end of the optic nerve."

Mauthner,[2] who quotes this case, thinks that the photopsiæ " were undoubtedly started and entertained by the products of inflammation deposited in the chain of the optic nerves. The hypertrophy of connective tissue in the intraocular end of the optic nerve found by the microscopist serves as an important guide. It was this hypertrophy of the interstitial connective tissue within the optic-nerve chain which compressed and mechanically irritated the nerve fibres."

Mauthner is evidently going too far. He exaggerates the hyperplasia of the connective tissue found in the intraocular end of the optic nerve into hypertrophy of the connective tissue of the optic-nerve chain, irritating the nerve fibres by

[1] Peppmüller : Ueber sympathische Augenaffectionen, *Arch. f. Heilkunde* 1871, p. 226.

[2] " Vorträge," Wiesbaden, J. F. Bergmann, 1881, Bd. i., p. 73.

compression, and calls this the cause of the subjective sensations of light. Before the invention of the ophthalmoscope an erroneous idea was generally upheld, that inflammation of the retina or the optic nerve ought to produce the most formidable subjective sensations of light. Since then optic neuritis and hyperplasia of the connective tissue of the optic nerve are met with every day, but they never produce photopsiæ.

Did Mauthner have this case in mind when he made the remarkable statement that a sympathetic neurosis could eventually prove more dangerous than serous iritis?

I can only adopt the opinion of Peppmüller, that the photopsia which set in one year after the injury was not of a sympathetic nature, but of central origin, and for this reason the eye ought not to have been enucleated. Even if indisputable sympathetic inflammation had been present, the enucleation of an eye possessed of almost complete visual power was not justified, according to generally recognized rules. Neither would neurectomy have been so. This eye was evidently one of those which can contain a foreign substance for a long time without any marked disturbance of vision and any other bad consequences. But such eyes do not afford any safety from any neurosis of central origin, just as little as eyes which have not been injured at all. Subjective sensations of light, like neuralgia, may be of peripheric or central origin. Instances are numerous indeed in which neuralgia of branches of the trifacial persists after cutting these branches. Why should the optic nerve never behave in a similar way? It does not always behave so, and for this we ought to be thankful. I remember a patient of Albrecht von Graefe who complained of tantalizing flashes of lightning in his blind eye. After enucleation the flashes continued in the empty orbit.

The severe subjective sensations of the last two cases were possibly of hemiopic nature, the same as the so-called flittering scotoma (*Flimmerscotom*), and were referred by the patients to the eye of the corresponding side.

If subjective sensations of light in blind eyes are of intraocular origin, the disfiguring operation of enucleation is

unjustifiable, since relief can be given by neurectomy without removing the eyeball, as shown in the following instance.

Case 5.—Hermann St., æt. twenty-nine, highly myopic, became blind in his left eye in the month of September, 1882, by detachment of the retina, which showed a rupture above and outward. When examined in April, 1883, this eye was completely blind; the pupil did not respond to the stimulus of light. Careful examination revealed slight quantitative perception of light in the direction of the visual axis. He complained of a continuous flickering before this eye, which increased when he was reading or writing, on which occasions he also noticed a slight flittering before the other eye. The latter had $M = \frac{1}{18\frac{1}{2}}$, $S = \frac{1}{4}$. I advised neurectomy of the left optic nerve for the relief of the symptoms on the same side, but did not give any promise in regard to the right eye. Before accepting my proposal, the patient sought advice elsewhere and was told that the eye had to be removed. In the month of June irido-chorioiditis set in in the left eye. The pupil was kept widely dilated by atropine, but a small synechia at the lower portion of the pupil remained. Neurectomy was now performed, while the inflammatory process was still progressing, with the result that the photopsiæ of this side ceased completely and permanently. In the other eye there was occasionally some flittering on exertion, but this also disappeared in the course of about nine months.

The unusually wide dilatation of the pupil in the eye operated upon was striking, the iris appearing as a very narrow rim, except below at the place of the synechia. Subsequently cataract and atrophy of moderate degree developed, as is usually the case in irido-chorioiditis in consequence of detachment of the retina.

In sympathetic inflammation neurectomy accomplishes the same results as enucleation, but here I wish to emphasize that no other chapter of eye-surgery has been as fruitful of illusions as this.

A. von Graefe[1] maintained, "with the greatest certainty," that he had observed a beneficial effect upon the other eye from an iridectomy performed upon the exciting eye. Who believes this nowadays?

The cases which are brought forward to prove the salutary

[1] *Von Graefe's Arch.*, Bd. ii., 2, p. 249.

effect of enucleation are all cases of serous uveitis, which always has a more favorable prognosis, and if the histories be examined more closely, the sympathetic nature of the disease will mostly remain in doubt. On the other hand, there are, of course, no objections against exsection of the optic nerve in a blind eye, if sympathetic inflammation has already begun in the other.

Violent pains in a blind eye, as, for instance, in absolute glaucoma and in chronic irido-chorioiditis, will also furnish an indication for neurectomy. In glaucoma immediate and complete cessation of the pain can be counted upon; in irido-chorioiditis relapses may occur, but they are the exception.

Finally, I will add that I have performed neurectomy with satisfactory results in cases of repeated and painful formation of blisters on the cornea of blind eyes, for which enucleation is frequently resorted to. The formation of blisters was not stopped, but the process of their formation became painless, and that is all we can ask for.

ON THE MEASUREMENT OF THE DEGREE OF ANÆSTHESIA PRODUCED BY COCAINE.

By Dr. LUCIEN HOWE, of Buffalo, N. Y.

(*With diagram.*)

IT is a well-established physiological fact that the irritation of a sensitive nerve produces an increase of blood pressure. This can be exactly measured with a suitable apparatus.[1] The following observations are based upon a knowledge of this circumstance. For, if one eye be brought under the influence of cocaine, the other remaining normal, it would seem possible to have the blood pressure indicate the degree of comparative sensibility. The effects are so prompt and so constant as to render this branch of study one of the most interesting in the whole range of physiology, and the results, if applicable to the human subject, teach us more than the varying description of different patients. The experiments here mentioned were conducted at the suggestion, and with the frequent aid, of Professor Zuntz, in his laboratory in Berlin, and though indebted to him for most valuable assistance, still there remained in this, as in the investigation of every new field, much to be learned from one's own failures. Success in these attempts depends so largely upon attention to detail, that it appears worth while to be explicit concerning the technique of the procedure. A description of the method pursued naturally resolves itself into a consideration of :

[1] Aubert in Hermann's "Handbuch Physiologie," vol. iv., part 1, p. 391. Von Bezold : "Untersuch. ueber der Innervation d. Herzens," p. 191. Loven (und Ludwig) : "Bericht der Sæchs. Ges. der Wiss.," 1866 S., 85. Foster : Second American Ed., pp. 260–270.

1st.—The preparation of the animal.

2d.—The apparatus for registering the blood pressure.

3d.—The arrangement for artificial respiration.

The animal best adopted for the purpose is a rabbit, and, the less adipose tissue it has, the less will be the difficulties of dissection. In some laboratories ether is used in such experiments, but, if the incisions are properly made, they are hardly more than skin-deep, and not more painful than those frequently inflicted upon the human subject without resort to an anæsthetic. In any case, the rabbit is first securely fastened, and the head either held by an assistant, or, still better, fixed in a Czermak's support,[1] for the purpose of keeping it quiet, while one tube is inserted in an artery and another in the trachea. It is usually more convenient to make the latter operation first. The hair having been cut away, a vertical incision is made in the median line, just below the prominence of the thyroid cartilage. By drawing aside the muscles the trachea is exposed, a grooved director passed under it, and through this a stout thread, ready to be tied. A glass canula is now selected, in the form of a T or Y, the size of the long arm of which should correspond very nearly with that which the exposed trachea is found to have. Moreover, it is held in place better if the end of the tube is a little enlarged. Before opening the trachea it is advisable to have ready one or two strips of blotting-paper, with which to remove the few drops of blood which may appear when that is divided. This is done by separating two of the rings with a sharp knife, so that they are attached by only a short piece of the cartilage posteriorly. The lower end of the trachea is thus kept from retracting into the thorax. Any oozing having been wiped away, the canula is introduced, the string tied, and if desirable the skin drawn together over the tube and united by a stitch. The introduction of a tube into an artery is a more delicate operation.

The two vessels which may be chosen are the carotid and the crural. For the present purpose the latter is usually

[1] See "Hand-book for the Physiological Laboratory," J. Burdon-Sanderson, fig. 204.

the better. The only suitable place to reach it is where it crosses Poupart's ligament, or where the pulsations can first be felt as the vessel descends. If the incision is made directly over it there is found beneath the skin a quantity of fat, varying with the condition of the animal. This being lifted up and inward, the pulsating vessel is seen at once, with the vein lying on the inner, and the crural nerve on the outer side. It facilitates the operation if the nerve is immediately divided, since the necessary manipulation causes pain to the animal, and consequent muscular contraction with variations of the blood pressure. Of course the artery must be isolated, but it is quite as important that every one of the branches be tied, even if they have contracted to almost microscopic size—as they often do. It is sufficient to ligate them once. Having isolated thus five or six millimetres of the artery, a ligature is tied around it below, another thread passed around it ready to be tied, and it is closed above with a very small clamp. The vessel is then simply nicked near the ligature, with sharp scissors, and the drop or two of blood which it contains is allowed to escape. So small an opening in so minute an artery is sometimes difficult even to see, but the aperture can be enlarged with a blunt needle till the introduction of a comparatively large glass tube is possible. This canula, which is small only at the point, and which has attached to it a few centimetres of rubber tubing, can then be tied in place. Not a drop of blood should enter it, and if the operation has been properly executed, not more than one or two have been lost. As soon as the two canulas have been introduced into artery and trachea respectively, the animal should be so protected as to retain its normal temperature. Experience proves that when any animal is extended in this constrained position, the body soon cools sufficiently to interfere with an experiment. A wrapping of cotton is sometimes enough to obviate this, but it is more convenient to use artificial heat, applied by a warmer. This consists of a sheet of galvanized iron a couple of feet long, and almost as wide, bent into a half-cylinder. A similar half-cylinder, more curved, is fitted within this, leaving a space between, which will hold

warm water. A second double half-cylinder can be made to rest upon the first—the two forming a tube,—and in this way the temperature of the animal can be maintained at the proper point.

Having described thus the manner of preparing the animal, it is proper to give some idea of the apparatus for registering the blood pressure.

The mercurial kymograph,[1] or instrument for measuring blood pressure, consists of two portions: a manometer, and a recording drum-wheel. The first is a U-shaped glass tube, about thirty centimetres long, half filled with mercury. One end of this is connected with the artery by means of a tube composed of alternate pieces of glass and rubber, the object of the combination being flexibility, the least possible expansibility, and a sufficient degree of transparency to allow air bubbles to be seen. This connecting tube is intended to contain some solution having about the same specific gravity as blood. Reference will be made to it later. The end of the manometer, opposite the one joined to the artery, has, floating upon the mercury, a delicate upright rod, and, attached horizontally to its upper end, is the so-called "pen." This is a piece of glass drawn to a fine point, which rests upon the surface of the drum-wheel. The latter is revolved by clock-work about a perpendicular axis, and of course receives the tracings of the pen-point. For convenience the outside of the drum is covered with a piece of lamp-blackened paper, on which the course of the pen is easily seen. By means of this arrangement every variation of the blood pressure is communicated from the artery through the intervening tube, and through the mercury, causing the pen to rise and fall with each pulsation of the heart, and at the same time to record the larger excursions due to greater alterations of the pressure in the entire arterial system. It is quite essential to the success of these experiments that the animal be under the influence of curare, and therefore artificial respiration becomes neces-

[1] A description of one very similar to that used will be found in Rollett's article of "Hermann's Handbuch der Physiologie," vol. iv., p. 231. See also Burdon-Sanderson's "Hand-book for the Physiological Laboratory," fig. 202, or "Methodik zur physiologischen Experiment. und Vivisection," von E. Cyon, plate xviii., fig. 1.

sary. Without this narcotic the animal instinctively closes the lids when an instrument or any object approaches the eye. Any attempt to open them is accompanied by an increase of the blood pressure, rendering it impossible to distinguish this effect from that of an irritant applied directly to the globe. It is therefore advisable to administer about 1 *cc.* of a one-per-cent. solution, hypodermically, some ten minutes before commencing, and repeat this dose at the end of that time if the effect is not then quite sufficient. Should the operation continue a long while, the same amount must be given again at the end of an hour. The general plan of the apparatus for artificial respiration is as follows: By means of a Sprengel water-pump, a current of air is sent into the lungs, and also drawn off after being respired. The pressure is regulated by the air passing, each way, through a bottle containing more or less water, as required. Finally, the current is interrupted at stated intervals, corresponding to the normal rate of respiration, by means of an electro-magnet, having a pendulum movement. The greater part of the apparatus was described by Dr. Curt Lehmann, in the *Verhandlungen der physiologischen Gesellschaft zu Berlin*, July, 1883, p. 48, and to him I am personally indebted for many hints as to its management and for suggestions leading to its further improvement. Having referred thus to the method of preparing the animal, of recording the blood pressure and continuing respiration meanwhile, it is proper next to state the manner of connecting the artery with the kymograph, and the plan of the experiment. Supposing the artery has already been dissected out in the way described and a canula introduced, the latter is filled, from a capillary point, with a portion of a solution contained in the tube connecting the artery to the mercurial column. Various mixtures are recommended for this, and very satisfactory results have been obtained from the use of the extract of leech heads in a 0.6 per-cent solution of salt water.[1]

[1] It is well known that the blood from a leech bite does not coagulate readily, and, as coagulation in the canula is a great obstacle to the success of such experiments, Dr. Haycraft advises that the heads of four leeches be cut in pieces, macerated for twenty-four hours in a solution of salt water (0.6 per-cent.), then filtered, and enough more of the salt water added to make 50 *cc.* The experiment was quite successful.

In filling the tube, considerable care must be exercised to avoid the introduction of air bubbles. It is therefore advisable to have one off-set, or branch, near the instrument, and another near the end, to be attached to the artery—or rather to the canula fastened there. A syringe filled with the solution is applied to the opening near the kymograph, and, while the rest of the tube is held upright by an assistant, a sufficient quantity is injected to fill it entirely. Several air bubbles, however, will remain between the solution and the mercury. The upper part of the tube must then be closed, and by suction these bubbles can be drawn into the syringe. By injecting the solution a second time, the tube is properly filled. Both the short branches are then clamped, and the end slipped into the piece of rubber tubing already on the canula. The connection is then ready to be completed, as soon as the clamp is removed from the artery. An estimate, however, must first be made of the pressure exercised upon the mercury merely by the column of water in the tube when in its proper position. For this purpose the pen is made to rest against the paper, and the drum revolved once. This is the zero line. Every millimetre that the pen is elevated above this, is due to the blood pressure only. If the clamp on the artery were now removed, the blood would tend to flow out of the animal into the tube, mingling with the fluid there; but the weakening effect of this can be avoided if pressure be made in the tube before the artery is opened. Accordingly, a sufficient quantity is injected from the syringe to force the pen up almost to the point it will subsequently reach—for a rabbit about fifty millimetres. When this is done, the clamp near the nozzle of the syringe is reapplied, and all is ready. The moment the clamp on the artery is removed, the arterial pressure forces up the pen, which at the same time makes short and rapid vibrations, corresponding with the contractions of the heart. As a certain amount of blood flows into the tube, so does the fluid in it to an equal extent, enter the circulation, producing an irritation which causes the pen to register at first a pressure considerably higher than normal. A few moments, therefore,

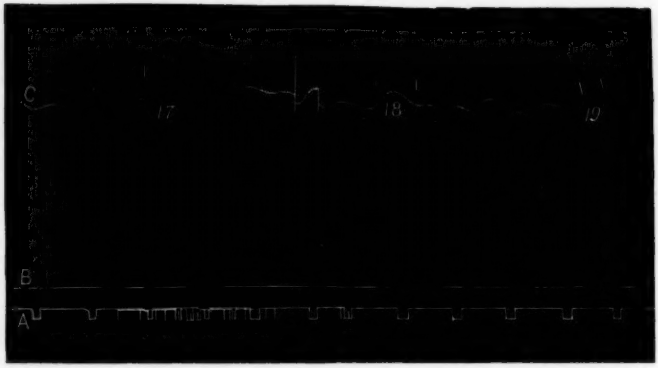
must be allowed for this effect to disappear before the drum is revolved, or any tests made. In most of the observations the drum of the kymograph was not revolved constantly, but merely a perpendicular line recorded as the pen was forced up. On the effect subsiding, another place was chosen, and the pressure again noticed when the other eye was irritated in the same manner. Very frequently, however, the length of time which the irritation lasted was measured by revolving the drum at a given rate. When this was done, an electric clock marked upon the drum, with a second pen—like the first,—each interval of five seconds.

In this way the blood pressure was written in a curve, the form of which showed, of course, whether the effect of the irritation was slow or prompt. The irritants used varied greatly. The conjunctiva and cornea of each were scratched with a piece of paper rolled to a point, and with the head or point of a pin. These two parts, as also the iris, were incised, and portions removed, and finally the effect of a current of electricity was tested upon each, by means of the induction apparatus of Du Bois-Reymond.

It is by no means an easy thing for the experimenter to estimate the amount of violence done in a given case, when touching the eye with any instrument. Thus in rubbing the conjunctiva or cornea with a piece of paper, the reaction upon the same eye varied considerably when there was an apparently insignificant change in the method. Accordingly, when the comparative tests were made, the irritation was applied, as nearly as possible, in the same way to each eye. In the case of operations of puncturing the anterior chamber, iridectomy, etc., perfect similarity of procedure could not be obtained. With Du Bois-Reymond's induction apparatus, however, the results were more satisfactory. The electrode was first placed on the part, and the increased blood pressure caused by this act allowed to subside. The key was then opened and the effect of a given current, for a given time, noted.

These apparently unimportant details have been dwelt upon at some length, not alone that so much depends upon

them, but particularly because I am unaware of any text-book, or article, giving the entire procedure in the manner which my experience, at least, teaches me is most advisable. In the following tables the varying heights of the blood pressure is given in millimetres. Proper allowance is also made for the force which depresses the mercury in one arm of the manometer and at the same time elevates it in the other—that is, the perpendicular excursions of the tracing point, above the line of no pressure, are in each case doubled. It has



The above diagram gives some idea as to the plan of the experiment. A is the line drawn by the electric attachment to a clock, the space between each one of the depressions being ten seconds in this instance. B is the zero line of no blood pressure. C is the line showing the variations of pressure. The small waves represent the heart's action. At 17 a current from a Du Bois-Reymond's apparatus was applied to the eye without cocaine. A small point above the line indicates when this was first applied, and a second point shows when it was removed. It will be noticed that the pressure then rises a considerable degree. At 18 a current from the same apparatus, of the same strength, was applied to the eye under the influence of cocaine. In this case the rise was very much less than at 17. At 19 the irritant was again applied to the eye with cocaine, with the same result virtually as at 18. The small perpendicular lines above the curve indicate, as before, the application and removal of the irritant. Between 17 and 18 it will be noticed that the pen marking the time was accidentally arrested in its regular action, and also that a sudden rise and fall of blood pressure occurred, due to extraneous causes. Allowance must be made for such sources of error, but the curve is given just as drawn.

been unnecessary, however, to take into account the force expended in dilating the connecting tube, for the reason that it was reduced to the minimum, and more especially that we here deal, not with absolute, but with comparative, variations. In attempting to give the results of the ex-

periments bearing on this part of the subject, it seems best to class together those on the different animals relating to the conjunctiva, cornea, or iris, since, the comparative effect of various irritants being tried on each of these structures in turn, it would tend to confusion if the method of procedure with each rabbit were detailed, and the conclusions drawn from the whole. In the following tables, the first column indicates the number of the observations according to this arrangement, marked simply for convenience in future reference. In the second column, the animal on which the operation was made, is identified, while the two eyes of the animal are indicated in the text by *N*, the normal one, and by *C*, the one under the influence of cocaine.

The nature of the irritant is described in a separate column. When electric current is mentioned, reference is made to the magnetic interrupter of the Du Bois-Reymond's apparatus.[1]

For that the distance between the two coils is given in millimetres and the greater this is the less the strength of the current. The length of time which the irritant lasts is an important factor, however, and is therefore usually stated. The blood pressure is given in millimetres, the point of beginning and subsequent rise being in separate columns, while the following one gives the difference between the tests in the two eyes. Thus, in the example first cited, the rise of pressure in the normal eye from thirty to thirty-three is only one millimetre greater than from thirty-one to thirty-three in the eye with cocaine. The strength of the solution, and the amount dropped into the eye, varied with different animals, and at different times with the same animal. These are facts of such evident importance that it would be of advantage to represent them also in the same table, but as the object of the present arrangement is more to show the effects of cocaine upon different parts of the eye, it was practically impossible to include in those records the various doses as noted, and the length of time between them, without giving rise to con-

[1] Burdon-Sanderson, p. 351, fig. 293.

fusion. Accordingly, when mention is made to the quantity or time, in the conclusions which follow, these refer more especially to another arrangement of the same data, with regard to these two factors. In the future it is hoped to show their relations more clearly. In general it was intended to keep up constantly the effect of as large a dose as had been previously found would produce the maximum effect in other rabbits. A variation from this rule was one of the reasons why the results, in the different tests, were not always the same. When the pupil remained undilated, or the dose was otherwise known to be insufficient, the fact was usually mentioned in the record.

Out of 124 observations there are 104, or 52 pairs of tests, which can be properly compared with each other. These do not include similar experiments made upon a few guinea-pigs and cats, when it was necessary to verify the method of procedure.

The results obtained can be formulated best as follows:

1st. When the same irritant is applied, under the same circumstances, to each eye, the rise in blood pressure is less in the eye under the influence of cocaine than in the other. The degree of difference in the two varies in proportion to three factors. These are:

(*a*) THE AMOUNT OF COCAINE USED.

While a .02-per-cent. solution will produce a difference in the size of the pupil, it required a .04-per-cent. solution to show any difference in the sensibility of the two eyes, as indicated by the blood pressure. A drop of this seemed to be the minimum amount which would produce any anæsthesia in the rabbit or cat. On the other hand, a two-per-cent. solution, at the time of its maximum effect, produces as much anæsthesia as one of four or five per cent. If the same rule applies to the human subject, it would seem useless to make the solution as strong as that frequently employed.

(*b*) THE TIME REQUIRED FOR ITS ACTION.

The minimum dose will produce a difference in the blood pressure, on the average, in from seven to sixteen minutes.

CONJUNCTIVA.

Obs.	Animal No.	Eye.	Irritant.	Begins.	Rises.	Difference.	After.
1	3	n	Touched lightly with paper.	30	33	1	4 m.
		c	" " " "	31	33		
2	1	n	Rubbed lightly with paper.	72	74	1.5	
		c	" " " "	74	74.5		
3	5	c	Rubbed with paper.	84	90	10	
		n	" " "	82	98		
4	4	c	Rubbed with paper and with a pin.	56	56	36	14 m.
		n	Rubbed with paper and with a pin.	56	72		
5	5	c	Introduced speculum.	86	98	40	12 m.
		n	" "	88	140		
6	4	n	Scratched with a pin.	60	100	38	
		c	" " " "	62	64		
7	3	c	Caught with forceps.	28	30	4	
		n	" " "	38	44		
8	2	n	Palpebral conj. pulled three times.	70	78	5	
		c	Palpebral conj. pulled three times.	70	73		
9	2	n	Palpebral conj. pulled five times.	70	80	8	
		c	Palpebral conj. pulled five times.	72	74		
10	3	c	Caught with forceps.	98	106	0	40 m.
		n	" " "	96	104		
11	3	c	" " "	42	43	6	
		n	" " "	42	49		
12	3	c	" " "	84	86	14	
		n	" " "	84	100		
13	2	n	Caught with fixation forceps.	70	84	10	
		c	" " " "	70	74		
14	1	n	Fixation forceps applied.	68	120	50	18 m.
		c	" " "	72	74		
15	1	n	Fixation forceps applied in same place.	68	121	41	19 m.
		c	Fixation forceps applied in same place.	76	88		
16	1	n	Fixation forceps applied.	72	80	5	
		c	" " "	71	74		
17	1	n	Electric current, 10 sec., coil at 65 *mm.*	76	104	24	
		c	Electric current, 10 sec., coil at 65 *mm.*	80	84		
18	5	n	Electric current, 60 sec., coil at 90 *mm.*	84	128	40	8 m.
		c	Electric current, 60 sec., coil at 90 *mm.*	84	90		
19	4	c	Electric current, 20 sec., coil at 75 *mm.*	50	60	24	17 m.
		n	Electric current, 20 sec., coil at 75 *mm.*	49	83		
20	4	n	Electric current, 12 sec., coil at 75 *mm.*	62	80	10	
		c	Electric current, 12 sec., coil at 75 *mm.*	64	70		

CORNEA.

Obs.	Animal No.	Eye.	Irritant.	Begins.	Rises.	Difference.	After.
21	2	n	Touched lightly with paper.	52	58	0	
		c	" " " "	60	64		
22	2	n	" " " "	70	74	0	
		c	" " " "	70	74		
23	5	c	" " " "	84	86	4	
		n	" " " "	82	88		
24	5	c	Rubbed with paper.	84	96	10	
		n	" " "	88	110		
25	1	n	" " "	70	84	13.5	8 m.
		c	" " "	72	72.5		
26	1	n	Epithelium partly removed.	68	72	3	2 m.
		c	" " "	72	73		
27	4	c	" " "	65	71	10	
		n	" " "	68	84		
28	3	n	Removed piece of cornea about 3 x 2 *mm.*	56	90	32	14 m.
		c	Removed piece of cornea about 3 x 2 *mm.*	30	32		
29	4	c	Removed piece of cornea about 2 x 2 *mm.*	58	62	22	
		n	Removed piece of cornea about 2 x 2 *mm.*	64	90		
30	1	n	Removed piece of cornea about 3 x 2 *mm.*	60	110	18	
		c	Removed piece of cornea about 2 x 2 *mm.*	70	102		
31	5	c	Removed piece about 2 x 2 *mm.*	82	106	9	
		n	Removed piece about 2 x 2 *mm.*	83	116		
32	3	n	Punctured cornea with syringe-needle and drew out aqueous humor.	40	101	41	
		c	Same procedure with other eye, and in addition injected the anterior chamber full of a five-per-cent. solution of cocaine.	68	80		
33	5	c	Electric current, 5 sec., coil at 80 *mm.*	110	118	4	5 m.
		n	Electric current, 5 sec., coil at 80 *mm.*	110	122		
34	5	c	Electric current, 20 sec., coil at 70 *mm.*	90	102	24	
		n	Electric current, 20 sec., coil at 70 *mm.*	94	130		
35	1	n	Electric current, 10 sec., coil at 60 *mm.*	70	82	8	
		c	Electric current, 10 sec., coil at 60 *mm.*	68	72		
36	5	c	Electric current, 20 sec., coil at 70 *mm.*	90	98	26	
		n	Electric current, 20 sec., coil at 70 *mm.*	94	128		
37	5	c	Electric current, 10 sec., coil at 70 *mm.*	98	100	14	
		n	Electric current, 10 sec., coil at 70 *mm.*	96	112		

IRIS.

Obs.	Animal No.	Eye.	Irritant.	Begins.	Rises.	Difference.	After.
38	3	n	Pinched forcibly with forceps.	60	100	10	
		c	Pinched forcibly with forceps.	50	80		
39	3	c	Drew out through small opening.	56	62	6	
		n	Drew out through small opening.	50	62		
40	3	c	Drew out.	48	60	16	
		n	" "	52	80		
41	3	c	Drew out larger piece.	54	64	37	
		n	" " " "	52	99		
42	2	n	Iridectomy.	54	74	10	
		c	"	56	66		
43	5	c	"	90	102	10	
		n	"	98	120		
44	4	c	"	64	80	8	
		n	"	66	90		
45	2	c	Electric current, 5 sec., coil at 25 *mm.*	60	82	2	
		n	Electric current, 5 sec., coil at 25 *mm.*	60	84		
46	5	n	Electric current, 20 sec., coil at 70 *mm.*	82	138	4	
		c	Electric current, 20 sec., coil at 70 *mm.*	80	132		
47	2	n	Electric current, 2 sec., coil at 10 *mm.*	58	78	6	
		c	Electric current, 2 sec., coil at 10 *mm.*	60	74		
48	5	c	Electric current, 10 sec., coil at 70 *mm.*	82	136	10	
		n	Electric current, 10 sec., coil at 70 *mm.*	80	144		
49	2	n	Electric current, 10 sec., coil at 75 *mm.*	62	88	14	
		c	Electric current, 10 sec., coil at 75 *mm.*	70	82		
50	3	n	Electric current, 2 sec., coil at 20 *mm.*	60	78	15	
		c	Electric current, 2 sec., coil at 20 *mm.*	78	81		
51	2	n	Electric current, 5 sec., coil at 10 *mm.*	56	84	16	
		c	Electric current, 5 sec., coil at 10 *mm.*	62	74		
52	1	n	Electric current, 15 sec., coil at 60 *mm.*	68	90	18	
		c	Electric current, 15 sec., coil at 60 *mm.*	70	74		

This effect, however, is only slight as to degree, and very evanescent. In one case the response to the irritant showed a difference at one trial, but not at another applied a minute or two later. The effect with a full dose, however, begins much sooner and lasts a longer time. A two-per-cent. solution has produced a degree of anæsthesia in a rabbit's eye equal to one sixth of total insensibility within three minutes after it was instilled. The greatest degree is reached, on the average, within the first quarter-hour, and in about twice that time has begun to subside.

The repetition of the application increases the anæsthesia in a marked degree. Thus, if two drops of a one-per-cent. solution are repeatedly instilled at intervals of half a minute for five minutes, the effect is, on the average, about one fourth greater than when four drops of a three-per-cent. mixture are instilled as closely together as possible to prevent their flowing out between the lids. Concerning the anæsthesia as related to the mydriasis, the former, when present, always precedes the latter, even when small doses are used.

(*c*) AS TO THE DIFFERENT PARTS OF THE EYE.

The anæsthesia is shown first in the conjunctiva and cornea. The average of seven trials would indicate that it appeared to a perceptible degree in the lower cul-de-sac earlier than in the upper, or in the cornea. The difference, however, is very slight, if it does exist, in reality. The amount of insensibility produced is much greater in these two external portions than in the iris. After a four-per-cent. solution has been dropped into the conjunctival sac, and a sufficient time for absorption allowed, if the aqueous humor be removed and dropped into the eye of a second animal, the anæsthesia and dilated pupil indicate its presence there. In other words, it reaches the iris by passing through the cornea.

In conclusion, it is but right to speak of the many sources of error that must be taken into account. At the first glance, for example, it will be seen from the tables given, that in some instances there was absolutely no difference in the blood pressure, in the two eyes, when irritated. In

these cases—*e. g.*, Nos. 10, 21, and 22—the less than minimum dose or more than maximum time accounted for the apparent failure. In every instance, however, it was necessary to give the figures just as they were read off, although sometimes they were seemingly contradictory. Instead of lengthening this paper further, these points—many of them of interest—are passed in silence. The general line of the study is clear enough, and the conclusions show that it is not altogether impossible to obtain a numerical expression for the degree of anæsthesia produced by cocaine.

CASE OF MORGAGNIAN CATARACT (FLUID HYPERMATURE) WITH TRANSPARENT FLUID CORTICAL.

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Translated by J. H. SHORTER, M.D., New York.

IN Morgagnian cataract, as all know, the fluid cortical ordinarily is of the nature of an emulsion, and so muddy that the light-perception is more diminished than in other forms of cataract; at the same time the lens capsule is, to greater or less extent, also often the seat of cataract. A case in which the fluid cortical as well as the lens capsule is entirely transparent and limpid, and in which, as a consequence, the acuity of vision is only slightly altered, should deserve to be published an account of its rarity.

It seems that cases with limpid liquid cortical have, thus far, not been known. Morgagni, it is true, described one of this kind as follows: "Is parvus erat (that is, the lens as taken from the globe) secundum omnes dimensiones, crassitudine autem vel paulo minor quam ejusmodi oculo conveniret. Facie anteriore in medio erat albus, sicuti per corneam transpexeram; cæteralbidus; et cum inter digitos leviter cumprimerem, mollis. Cum vero ejus tumicam incidere cœpissem, continuo aqua erupit, nihil purulenti habens, imo pura et limpida, eaque copia pro parvitate crystalli ut hic statim ad multo minorem crassitudinem redigeretur. Quidquid de

[1] The case was presented and demonstrated before the Congress of Finnish Physicians on 14th Sept., 1883, and a description of the same appeared in the 2d vol. of the "Finska Läkaresällskapets Handlingar," in 1884.

substantia ipsius reliquum fuit, lentis pristinam figuram retinuit."

Since this, however, there has been no other case reported, and Otto Becker, with his great experience and most extensive acquaintance with the literature of the subject, does not mention any similar case in his latest work, "On the Anatomy of the Normal and the Diseased Lens," Wiesbaden, 1883. He seemed also to be in doubt, from the very fact that the liquid cortical was clear, how far Morgagni's description, as given above, could apply to a so-called Morgagnian cataract of the present time. In connection with the question by whom and to what form of cataract the title "Cataracta Morgagni" was first employed, he repeats the passage from Morgagni regarding it, in his monograph on the "Pathology and Therapeutics of the Lens System" in Graefe–Saemisch's "Handbuch," volume v., page 265, and adds: "This case can be considered, without further discussion, as that which we now call a Morgagnian cataract; we have the capsular cataract, a fluid cortex, and a regularly circumscribed nucleus suspended in it. One thing only does not correspond: that is, that the outflowing liquid is clear and not turbid." Now, as the case which I am about to report shows that in a Morgagnian cataract the fluid cortical does not of necessity require to be opaque, it can be taken without doubt that Morgagni's description applies also to cases of this kind.

The case observed by me occurred in a peasant of "Sawitaipal," Abel Adamsson Natko, fifty-five years old, of strong build, and good general health. He had always had good eyes and enjoyed good sight, until recently, in 1879 when the eye in which the Morgagnian cataract is now present was diseased for a couple of weeks. The nature of the disease cannot be determined from the description of the patient. The eye, however, under medical treatment was quickly cured, and, as the man distinctly asserts, without any diminution of sight. But in October, 1882, the visual power commenced to diminish, and without any preceding pain or symptom of inflammation, according to his statements, simultaneously in both eyes. The diminution of sight was so rapid, that already by New Year, 1883, he could no longer read, and in a short time thereafter could no longer get about without help.

In the spring of the same year he could, however, see again decidedly better, so much so that he could find his way alone though with difficulty.

On the 20th of August, 1883, he sought admission to the eye clinic on account of the trouble of his eyes. On examination all the internal organs were found to be healthy. Especially may be mentioned that the heart and vascular system were normal, and the urine contained neither albumen nor sugar.

In left eye he had ordinary, almost mature senile cataract, which was operated on by me with good result. V with + 11 D = $\frac{6}{18}$. The extracted nucleus had a diameter of 8.5 *mm.* and was 4.5 *mm.* thick.

It may be remarked regarding the operation that the vitreous appeared thinly fluid, and that in the operation a moderate amount of it was lost.

The right eye presented the following conditions: the external parts of the eye healthy; the ant. chamber deep; the iris somewhat atrophic, so that it reacts only imperfectly under atropine; the pupillary border is finely indented and is tremulous by the least movement of the eye.

In the lower part of the pupillary space, the lens nucleus, about 5 *mm.* in diameter, is seen, and above the latter the black pupil. The outer layers of the nucleus seem a dirty white, but the centre presented a yellowish-brown reflex.

By closer examination there could be seen, in addition to this in the pupillary area, and especially distinctly by focal illumination, a quantity of very fine, sharply bordered, almost chalk-white dots, which remind one of the dotting of Descemet's membrane in iritis serosa, and which might be regarded as deposits from the fluid contained in the posterior surface of the ant. lens capsule, but which might also depend on some local trouble in the capsule itself, although from the picture which the fine dots presented this explanation does not seem to be valid.

When the patient bowed his head to one side, the nucleus would sink immediately in the same direction; when he inclined the head forward, the nucleus lay directly on the iris; on bending backwards, the nucleus would also sink back, though apparently not more than 1.5 *mm* at most.

Above the nucleus by ophthalmoscopic examination a tolerably distinct image of the fundus was obtained. The latter was normal.

As mentioned above, the vision of the patient, which had formerly diminished to that which is usual in cataract, had in

this eye become so much restored that since spring he had been able to get about without help.

He had not used glasses, and without them his present vision was not better than counting fingers at 2.5 metres, but with convex 10 D, vision is $\frac{6}{30}$, and by employing a stenopæic hole or slit it improves to $\frac{6}{9}$.

This great difference in vision, according as the test is made with or without artificial shading, does not depend, however, or, if so, in a very small degree, on astigmatism ; for he sees equally well in whatever meridian the slit may be held, but it depends on the large circles of diffusion which must naturally arise in consequence of the very irregular shape of the pupil.

In examining the vision for the near, a phenomenon appeared which seemed to me peculiarly noteworthy. In repeated tests for reading, the patient chose always the strongest glasses. With + 18 D, when this was associated with artificial shading, he could read Jäger No. 2 at 8 inches. With weaker glasses he read worse, and only coarser print.

With the other eye, which had been operated on for cataract, in which the vision for distance was sharpest with + 11 D, he read best with + 14 D. That the eye with Morgagnian cataract should see best for near with such a strong glass, when it might be expected that + 13 or + 14 would be most suitable, can only depend on the fact that the lens, which is here so greatly altered, effects the accommodation in a highly abnormal manner, and in a way very unfavorable to distant sight on the part of the patient. This supposition must also be regarded as very reconcilable with the mechanical conditions.

If the zonula is relaxed the normal lens, on account of its proper elasticity, assumes a more convex shape. Here, on the contrary, where the lens represents a sac filled chiefly with liquid, the latter when exposed to the stretching of the zonula must represent a lens with higher refractive power than if the zonula was relaxed and the shape of the sac was really determined by the intra-ocular pressure.

This explanation of the appearances would have been, according to my opinion, entirely satisfactory, even if the phenomenon had not also been observed during entire atropinisation of the eye —that is, paralysis of the ciliary muscle. I can therefore explain the occurrence to myself only in this way : that, in the peculiar conditions present, some other force besides the contraction of

the ciliary muscle must be able to take part in the accommodative change in the shape of the lens.

That the case is one of Morgagnian cataract, even if with transparent liquid cortical, is without doubt, and this is also the opinion of Professor F. J. von Becker, the director of the clinic, who likewise examined the eye.

The course of the disease corroborates this assumption, for the vision improved after the cortical became fluid and again transparent; the examination of the case in the present status confirmed it likewise.

The sole affection with which it might possibly be confounded would be a luxated cataractous lens, which, at first sight, it much reminded me of. It had the iridodonesis in common with this, and the nucleus, in one case, could represent the lens, which in luxation is often more or less rudimentary. But still there were peculiarities which distinctly distinguished it from this affection.

In observing closely by focal illumination the respective behavior of the nucleus and of the before-mentioned fine dots, one sees that the latter always preserve the same situation in the pupillary area, even when the nucleus changes its position, and that they always remain in the plane of the iris, when the nucleus sinks backward. In case of a luxated lens, the dots which lie outside the nuclear area are seen as lying on the zonula of Zinn, and must of necessity change their position as well in a vertical as in a horizontal direction so soon as the lens changes its position. This, as stated, not being the case here, the dots must lie on the capsule, and the capsule separated by a large quantity of clear liquid cortical from the nucleus when the nucleus sinks backward.

Another circumstance which likewise supports the diagnosis is this, that the other eye had an ordinary senile cataract, while lens-luxation is almost always binocular.

Operative treatment of the case could hardly come in question, and the patient was discharged on 15th September.

As the sight, which had been reduced very much by the cataract, was spontaneously very much restored the case may certainly be regarded as a successful attempt on the partof nature to cure cataract.

PARTIAL EMBOLISM OF THE ARTERIA CENTRALIS RETINÆ AND ITS BRANCHES.

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Translated by Dr. Morris L. King, of New York City.

EMBOLISM, as a whole, is as well understood as any part of general pathology, but we are yet far from understanding clearly all the clinical symptoms accompanying or causing embolism of the central artery of the retina. The anatomical relations of this artery are well known, and for this reason it would seem to be easy to prognosticate the consequences of its occlusion, if the size, variety, and seat of the embolus are given. We are not obliged to wait for an autopsy to get the data as to the changes in the vessels and retina which follow embolism of this artery, but we are fortunately able not only to observe them from the beginning, but to see them considerably magnified. This disease is not very rare, and the literature of the subject will show a large number of cases that have been carefully observed and accurately reported. But even with all these advantages, it was so difficult to explain the matter satisfactorily, that even as late as 1870 v. Stellwag doubted the fact that embolism of the central retinal artery ever took place.[1] In 1873 Mauthner[2] declared that in the majority of these cases, there was another disease present, which had as yet not been recognized, and only lately Hirschberg

[1] "Lehrbuch der pract. Augenheilk.," 1870, page 249.

[2] Zur Lehre von der Embolie der Arteria centralis Retinæ, *Wiener med. Jahrb.*, 1873, Bd. ii., p. 10. Separat-Abd.

stated that for the present many of the most important facts must remain undecided, although the pathological anatomy of the subject was quite clear.[1]

Total, permanent occlusion of the trunk of the central retinal artery must necessarily be followed by permanent absence of blood and consequent death of the nerve layer of the retina, unless a collateral circulation be established through the vessels of the ciliary system.

In the optic disc, as is well known, there are anastomoses between the central and ciliary arterial systems. But it has also been shown that these anastomoses are too few and too small to completely take the place of the occluded central artery.[2]

Many ophthalmologists assume that the numerous retinal vessels which emerge from the lateral edge of the papilla itself, or even from the ring of connective tissue about it, and which have no apparent connection with the main trunk of the artery or its branches, originate in the ciliary system, and that these so-called cilio-retinal vessels may take the place of the occluded central vessel. But up to the present no one has been able to demonstrate that these cilio-retinal vessels are correctly named. Heinrich Müller and Nettleship have made longitudinal sections of the optic nerve, which show small retinal vessels passing over the edge of the optic papilla, whose origin in the central artery is not to be seen.[3] The attempt to show that these vessels originate in the central artery have, therefore, not been successful, but at the same time it has not been demonstrated that these vessels belong to the ciliary system. Those who deny the origin of these so-called cilio-retinal vessels in the central artery, simply because the connection between the two has never been seen, should be careful not to commit themselves by asserting that they belong to the ciliary system, because their connection and origin in this set of vessels have

[1] Ueber Embolie der Netzhautarterie, *Centralbl. für Augenheilk.*, 1884, p. 1.

[2] Leber: Bemerkungen über die Circulationsverhältnisse des Opticus und der Retina, *v. Graefe's Archiv*, Bd. xviii., 2, page 32, und Graefe-Sæmisch's "Handbuch," Bd. ii, page 307; vol. 2, page 547.

[3] H. Müller: *v. Graefe's Archiv*, Bd. iv., 2, page 10. E. Nettleship in *British Med. Journal*, Feb. 5, 1876. "Ophth. Hosp. Rep.," vol. viii., page 512; and vol. ix., 2, page 161.

never been seen either. Until some one succeeds in demonstrating satisfactorily the whole course of one of these cilio-retinal vessels, it will be well to assume that they are abnormal branches of the central artery and not an abnormal ciliary vessel.

In order to explain the clinical symptoms of embolism of the central artery, many authors have been forced to assume that there was free communication between the retinal and choroidal vessels. Such connection has never yet been seen, although many thousand eyes have been carefully dissected, and it therefore seems rather questionable to assume that such connection did exist in just those cases in which its presence would enable the observer to explain the symptoms which appear. If we consider the embryonal development of the part, we are forced to disbelieve any statement which assumes that one or more vessels pass out from the choroid, through the hyaline membrane and the posterior retinal layers, and anastomose with the branches of the central artery of the retina.

Our knowledge of the anatomy of the vessels of the retina has not yet shown how the retinal vessels would be filled with properly circulating blood, after the central artery had been completely occluded. We must, therefore, endeavor to see whether there is not reason to believe, judging from clinical facts, that our anatomical knowledge of the vascular system of the retina is not yet complete, and that there is reason to believe that the anastomoses in the optic papilla, between the ciliary and retinal vessels, may be sufficiently numerous and large to compensate for the occluded central artery, and that there is a connection between the so-called cilio-retinal and ciliary vessels, and that in many cases large connecting branches convey blood from the choroid to the retina. It would not be the first time that clinical facts had indicated anatomical relation hitherto unrecognized, and that subsequent investigation, directed to the point in doubt, had shown the supposition to be correct.

Clinical observation of cases of embolism of the central artery of the retina, in which the retinal vessels again

become full, and circulation was established shortly after the occurrence of the embolism, refute the assumption that the dilated vessels of the sclerotic margin have taken the place of the occluded central artery. Experience shows that after ligation of an artery the collateral circulation, which carries blood to the occluded branches, is the least active just after the ligation, and gradually becomes more and more efficient by gradual dilatation of the smaller vessels, until at last it completely suffices. In the earlier cases of embolism of the central artery, there was sudden absence of blood, followed in several hours by a normal dilatation of the vascular system with blood, which, however, disappeared several days later, and was followed by very marked atrophy of the vessels. We will later on describe several such cases. The literature of the subject contains many of them, and every ophthalmologist of experience will assuredly remember similar cases in his own practice. If, in these cases, the connection between the central and ciliary vessels in the optic papilla were large enough to fill the branches of the central artery with circulating blood, but few hours after the occlusion, it would be unexplainable why these connections between the two vascular systems became contracted later on, and why this contraction proceeded very rapidly until there was marked atrophy of the vessels of the central vascular system. It should also be noted that during the primary congestion, the color of the papilla is the same as when the vessels are refilled, which does not uphold the supposition that the branches of the scleral vascular circle furnished the blood for refilling the retinal vessels.

Since oculists had begun to assume that these small retinal arteries, which project from the papillary margin towards the macula without apparent connection with the central artery, are ciliary vessels, there have been three cases of embolism of the central artery described, in which the so-called cilio-retinal vessels were present. In all of them circulation reappeared, and there was partial restitution of vision. While one of these cases was reported by Prof. Hirschberg, who doubts the cilio-retinal origin of these little

vessels, and who particularly remarks that their presence did not seem to have the least influence on vision,[1] Benson and Birnbacher ascribed a considerable influence to these vessels in the formation of the ophthalmoscopic appearances and the condition of vision.[2] All of these observers found that those parts of the retina supplied by these vessels retained their normal appearance, while the neighboring parts presented the well-known hazy appearance peculiar to embolism. If the above conditions were only explainable by assuming that these unoccluded arteries originated in the ciliary vessels, then we would be obliged to agree with Benson and Birnbacher, and acknowledge that they had presented a plausible argument in favor of the connection of the cilio-retinal vessels with the vascular system of the choroid. As a matter of fact, the ophthalmoscopic appearances seen by both writers were entirely similar to those seen in embolism of single branches of the central artery. From the fact that within a short time two cases of embolism of the central retinal artery have been reported, in which there was no interference with the circulation of blood in the so-called cilio-retinal vessels, we may only assume that, in all probability, these vessels originate from the main trunk before the latter reaches the lamina cribrosa, which is the usual seat of the embolism. From the fact that there is no change in calibre in these so-called cilio-retinal vessels either before or after the restoration of circulation in the retina, Birnbacher assumes that they originate in the ciliary arteries. This argument is not convincing. We are justified in assuming that a sudden hyperæmia of the ciliary vessels would follow the plugging of the central artery, and that during the continuance of this embolic hyperæmia of the retinal vessels of normal origin, there would also be a congestion of the retinal vessels originating in the ciliary system, which is just contrary to the conclusion arrived at by Birnbacher.

[1] Ueber Embolie der Netzhautarterie, *Centralbl. für pract. Augenheilk.*, 1884, p. 77.

[2] Benson: Embolism of the central artery of the retina modified by the presence of a cilio-retinal artery, "Ophth. Hosp. Rep.," vol. x., t. iii., p. 336. Birnbacher: Ein Fall von Embolie der Arterie cent. Ret. bei vorhandenen cilio-retinal Gefässen," *Centralbl. für pract. Augenheilk.*, 1883, p. 207.

In Hirschberg's case of embolism, in which there was a cilio-retinal artery, the latter underwent the same changes to a certain degree, as did the remainder of the retinal vessels; it became thread-like, and in this manner distinctly showed that it had its origin in the central artery. We have only to state that these so-called cilio-retinal vessels are exactly similar to the remainder of the arteries seen with the ophthalmoscope, except that their origin in a large trunk is not visible, and that they are entirely different from the choroidal vessels, to show that the existence of retinal vessels of ciliary origin is neither justified by clinical facts nor by anatomical investigation. Continued investigation may, perhaps, show that such vessels do occasionally exist. In reference to this possibility it may be well to state that the presence of such cilio-retinal vessels in an eye in which the central artery was completely plugged, could have no other effect than to preserve the integrity of that part of the retina supplied by them. The capillary connections between the normally filled vessels of ciliary origin and the collapsed retinal arteries of central origin could not transmit a quantity of blood sufficient to nourish the affected parts, as is proven by that class of cases in which that part of the retina supplied by the plugged vessel remained insensitive, although the capillaries of the plugged artery were in direct connection with those of normally filled neighboring vessels. Clinical observation does not give any reason to assume that there are large anastomoses between the choroidal and retinal vessels. No one has as yet succeeded in demonstrating ophthalmoscopically such a connection in any normal eye, and not even in those few cases of embolism for which this hypothesis was originated, could such a connection be demonstrated. In a case of embolism of a branch of the central artery, Knapp saw a considerable dilatation of the vessel just posterior to a partially empty part of the occluded vessel, and thinks that this dilatation may have been caused by the entrance at that point of a ciliary artery.[1] It is not necessary to assume so improbable

[1] Embolism of a branch of the retinal artery with hemorrhage in farctus in the retina. These ARCHIVES, Vol. i., No. 1, p. 64.

a state of affairs, for it is easy to see why the column of blood should seem smaller in a limited area, the lumen of the vessel being partially filled by an embolus and its walls thickened and closed by inflammatory softening, while behind this part the vessel had its normal appearance, the lumen being pervious and the walls not inflamed. All those authors who declare that the restoration of normal circulation in the branches of a plugged central artery depends on the presence of copious anastomoses between the retinal and choroidal vessels, support their view by quoting cases in which there was a sudden increase in calibre of a retinal vessel which was abnormally thin in part of its course, leaving out of consideration the fact that local changes in the walls of the vessel may cause the same irregularity in the apparent size of the column of blood in neighboring parts of the same vessel.

The following case will show how unsafe it is to assume that, because after embolism of the central trunk a retinal artery is only filled with blood at a certain distance from the papilla, and the central portion appears like a white band for the distance of several diameters of the disc, the central portion is impervious, and that the peripheral part is fed from a choroidal artery.

Case 1.—Stephen B., aged seventy-six and a half, came to the clinic of Prof. von Jaeger in June 13, 1875, because two and a half months ago he had suddenly become blind in the right eye. The sharply defined papilla was pale, of a dirty green color, and slightly excavated. The veins on the papilla were somewhat smaller than normal and had no reflex, but in the retina they were of normal width and provided with reflexes. The trunk of the central artery was hardly to be recognized as a light, ill-defined line. The arterial branch passing upwards is well-filled from the centre provided with a reflex streak; the remaining five arteries visible on the papilla appeared as flat, white bands. The latter extend over the edge of the papilla, and at a distance of from one to one and a half papilla-diameters assume the color of ordinary arteries with reflex streaks, but remain somewhat narrower than normal arteries. On pressure on the globe the artery on the papilla which was filled with blood became empty, without

the appearance of pulsation; on relieving the pressure, a narrow thread of blood appeared in the centre of all the white bands which represented arteries, extending from the centre of the papilla to the spot where these arteries presented a normal appearance.

While we could hardly assume that five retinal arteries were supplied with blood from the choroidal vessels by means of invisible anastomoses, the results produced by pressure on the globe clearly demonstrate that the white arterial bands were pervious to blood, and that their contents were invisible only because their walls were thickened and clouded.[1]

From the above observations it will be seen that we are at present not able to imagine how circulation can be restored in a retina whose central artery is completely occluded by an embolus.

We are therefore forced to assume that in that class of cases of embolism of the central artery or one of its branches, in which shortly after the occurrence of embolism the blood again circulates in the diseased district, the plug either did not entirely fill the lumen, or, at least, after a short time ceased to fill it completely.

Following the example of Schneller and Knapp, Leber declared it probable that in those cases in which embolism was soon followed by a dilatation of the vessels, with an increase in vision, the embolus did not entirely occlude the lumen of the vessel.[2] Mauthner, on the contrary, says that the diagnosis of partial occlusion of the central trunk is to be made with caution, because, as has been shown by past experience, a very small continuous arterial

[1] Pressure on the eye shows that by massage an increased amount of blood can be sent to the retina, and thus, perhaps, remove a soft, fresh embolus, or break it up and render it innocuous. In similar cases, the papilla could be seen to become rosy on discontinuing the pressure, and invisible vessels came in sight, and straight arteries became tortuous. By resorting to pressure twice, Wood-White caused a typical case of embolism and blindness to disappear. (Embolism of art. cent.; re-establishment of circulation witnessed with the ophthalmoscope. The *Ophthal. Review*, edited by K. Grossmann, etc., vol. i., Jan., 1882.—*Centralbl.*, 1882, page 303.)

[2] Schneller: Fall von Embolie der Central-Arterie der Netzhaut mit Ausgang in Besserung, *v. Graefe's Arch.* Bd. viii., p. 273. Knapp: Ueber Verstopfung der Blutgefässe des Auges, *v. Graefe's Arch.*, Bd. xiv., p. 217. Leber: Graefe-Sæmisch's "Handbuch.," Bd. v., p. 544.

supply is sufficient to nourish and preserve the integrity of the retina, as is shown in so many cases of neuritis optici and in ischæmia of the retina in the asphyctic stage of cholera; and further, because an interrupted stream of blood, as in the arterial pulse, does not necessarily cause a loss of vision; and further, it is hardly possible to suppose that an embolus would attach itself to the wall of any vessel in which it did not fill the whole lumen, but that it would be carried on by the blood-current until it reached a place where it filled the whole lumen. Cases of optic neuritis in which there are apparently[1] small columns of blood in the retinal arteries, combined with good vision, are not uncommon, but apart from the fact that the visible width of the column of blood cannot be said to be identical with the true one, we must also consider that in partial embolism the vessels are emptied at once, while in neuritis this occurs slowly, thus having its influence on the consequences of the resultant anæmia.

In cholera patients the thickened blood flows more slowly through the retinal vessels than in cases of partial embolism of the central retinal artery, but in the first case the decrease in quantity and rapidity of circulation of the blood will not be as detrimental as regards the nutrition of the retina, as in the latter case, because the cholera-ischæmia is caused by decrease of the blood serum, while in embolic ischæmia the composition of the blood circulating through the retinal vessels has undergone no change, the proportion of red globules and quantity of albumen being less in the same proportion as the serum.

The fluctuation of the blood circulation in the retina, caused by the heart's action, as is shown by the arterial pulse in cases of increased intra-ocular pressure, very rarely has any appreciable influence on the acuteness of vision, as we often find the vision of glaucomatous eyes is as great during the time the pulsations continue as during the intermission which takes place spontaneously or after the use of eserine. The continuous circulation of a small quantity of blood under low pressure, as is the case in partial embolism of

[1] *L. c.*, p. 3, des Separat-Abdrucks.

the central artery, must necessarily have a different effect on the nutrition of the retina than the temporary decrease in the quantity of intra-ocular blood which occurs only during the diastole of the heart. There is finally no difficulty in imagining an embolus of the shape of a little leaf or lump, whose corners may become engaged in the wall of the vessel, the blood then passing by its irregular corners. That the embolus shall consist of a soft, flexible, nearly round mass, which is forced along the vessel by the blood-current until it lodges and fills up the whole lumen like the cork of a bottle, is only one of many possible cases, it is not at all necessary to assume that this is the only one which really occurs.

Of much more importance than Mauthner's objections is a fact which Leber has advanced against the view of partial embolism. One would suppose that a partial embolus in the central artery or any of its branches would soon completely fill the vessel by the formation of a thrombus.[1] Leber expected to settle this point by experiments and autopsies, but up to the present it has been impossible to find a single case in which it can be shown that an embolus partially occluding the retinal arteries may remain for months without causing a total stoppage of circulation by the formation of a thrombus. Later on we shall give the results of such an examination. Even at the time Leber made the above statement there was no lack of experiments which went to prove that emboli did not in all cases give rise to thrombi; such cases were also known to have occurred in the human being. Cohnheim found that thrombi never formed about emboli which were introduced in the arteries of the frog's tongue, be the emboli of whatever size and quality they might.[2] He acknowledges that he is unable to definitely explain why such should be the case, and ventures the suggestion that perhaps the unchanged vessels in the frog's tongue are too small to allow the formation of a thrombus about a foreign body. It is also the case in human pathology, that thrombi are never seen in vessels be-

[1] Graefe-Saemisch's "Handbuch," Bd. v., 2, p. 548.

[2] Untersuchungen über die embolischen Processe, p. 10.

low a certain size, even under circumstances which favor the coagulation of the blood in the body, and which at the same time has caused thrombi to appear in vessels of larger calibre.[1]

There are no facts in pathology which would indicate that a partial embolism of the arteria centralis retinæ or its branches might not occur, but there are many which render such a thing quite probable. We may therefore assume such to be the case generally, and not only, as Leber suggests, in that class of cases in which vision is restored simultaneously with the circulation. All cases of embolism followed by a restoration of circulation should be put in one class, and the fact that the function of the retina is also restored must have no influence on this classification. Mauthner does not recognize the diagnosis of partial embolism of the central artery, and is therefore correct in saying that all cases in which a later though transient dilatation of the vessels had been observed, were not to be considered as embolism of the central artery.[2] If these cases of sudden loss of vision, occurring in patients with heart disease, and in which the ophthalmoscope indicates great ischæmia of the papilla and retina, followed by rapid atrophy of the whole retinal vascular system, are not cases of embolism, what are they? Mauthner does not give any opinion on this point. If the embolic nature of these cases is denied, it is impossible to form any clear idea as to their true nature. Whoever accepts Mauthner's view must perforce consider that the majority of diagnoses of reported cases of embolism are incorrect, without furnishing a correct diagnosis in their place. This unfortunate fact should not in itself be any argument against Mauthner's view. It may be shown, however, that Mauthner argues from a false standpoint in assuming that the well-known clinical history of embolism of the central artery is caused only by complete and not by partial closure of the lumen of the vessel, and for this reason symptoms which do not agree with a diagnosis of total closure of the vessel, militate against the

[1] Cohnheim, *l. c.*, p. 10.

[2] Cohnheim, p. 11, des Separat-Abdrucks.

diagnosis of embolism; especially is this the case as regards restoration of the normal circulation of the retina. The following history of a case of this kind, together with the result of the autopsy, proves that partial closure of the central trunk by an embolus produces a set of symptoms which in all respects are similar to those caused by complete stoppage of the circulation, and thus removes all doubts as to the embolic origin of that class of cases in which the clinical picture of embolism of the central artery is combined with a rapid restoration of the circulation, and also removes all necessity for assuming the existence of an extraordinary connection between the retinal and choroidal vessels.

CASE 2.—Paul G., aged thirty-three, entered Professor Rokitansky's service on July 20, 1883. He had already been treated in November, 1881, for endo-carditis, with slight general systolic murmur. Up to June, 1883, he was able to follow his arduous calling of mountain guide. After that when he made long journeys he suffered from very severe palpitation of the heart, want of breath, so that he was often obliged to stop and rest. Later he had profuse epistaxis, and after several attacks he was quite anæmic. On August 26th, at 7 P.M., while on the way from the hospital garden to the ward, he was seized with a very severe palpitation of the heart, followed by a feeling of heat, and before he could reach the ward, every thing turned black before the left eye. He compared the palpitation to "the working of a machine in the chest." After he had got to bed all the symptoms disappeared excepting the blindness.

On August 27th, at 10 A.M., Prof. Sachs examined the patient for the first time. The patient, who was highly anæmic, could hardly remain erect. The heart is enlarged in both the short and long diameters, more so in the latter; the cardiac impulse is heaving, and on exercise is combined with a "frémissement." At the apex is heard a slight systolic murmur, and over the aortic valves are two loud murmurs. The spleen is enlarged and palpation in that region is painful; lungs are normal. Slight amount of albumen in the urine.

The left pupil is somewhat larger than the right, only reacting consensually. Tension slightly decreased in the left eye. Media clear. Papilla pale, gray-blue, outline indistinct in all directions,

especially downwards. In the centre of the papilla the retinal vessels are contracted to rosy, thread-like twigs, and the arteries and veins cannot be distinguished. On a small vessel passing downwards a yellowish-white spot can be seen just below the edge of the physiological excavation. Even at the edge of the papilla the vessels seem to be fuller and arteries and veins can be distinguished. In the veins, excepting the largest, the inferior temporal, the column of blood seems to be composed of alternate red and light parts. No motion can be observed in these columns of blood. The cloudiness of the retina extends somewhat beyond the papillary margin in an upward, inward, and downward direction, and laterally it extends in the shape of a bluish-white cloud, on which the fine vessels in the macular region are remarkably distinct. In the vicinity of the fovea centralis there is a small, rectangular red spot. Amaurosis. Right eye is normal.

Nine hours after the first examination, that is, about twenty-four hours after the loss of sight, the ophthalmoscopic appearances had changed considerably. The arteries had again reached normal size, and the reflexes had also appeared. It could now be seen that the white spot seen in the morning was attached to the lower main arterial trunk. The latter was of the same width above and below the spot. The veins contained more blood than in the morning, but they were still smaller than the arteries. All the veins became more attenuated towards the papilla; the end of the superior nasal vein was invisible. In most of the main venous trunks the column of blood was divided into small cylinders by numerous light spots; the blood in the veins moved slowly towards the papilla, the movement being observed as far as the centre of the papilla. This condition of the blood could not be seen in the inferior temporal vein. The cloudiness of the retina and the red spot in the vicinity of the fovea centralis were unchanged. Tension was still decreased.

Aug. 28th.—The veins still continue smaller than the arteries, becoming narrower toward the centre of the papilla. The column of blood in the veins is still marked by the light spots, but no further movement is noticed. The rectangular red spot in the vicinity of the macula has increased in size, is more circular, and of a darker hue than yesterday. Its diameter now is about one fourth the diameter of the papilla.

Aug. 29th.—Movement of blood in the veins again visible. The apparent divisions in the venous blood-column are not visible

now, but there are alternate light and dark-red spots. The reflexes of the venous blood-columns are very indistinct. Tension is still decreased.

Aug. 31st.—At noon there was a sudden blinding of the right, apparently healthy, eye. It lasted only a few minutes, and left a slight indistinctness of vision. Ophthalmoscopically the only anomaly seen was an oblong yellowish-white spot, situated about two papilla-diameters from the disc covering one of the columns of blood; the latter, which could still be seen, seemed to be of normal width. Accurate ophthalmoscopic and glass tests cannot be made, because of the great weakness of the patient. It is only shown that the patient can read small print, and that there is no defect in the visual field. In the left eye a small extravasation of blood has appeared at the upper and outer edge of the papilla. There is no recognizable circulation in the veins.

Sept. 2d.—Blood-columns in the veins are interrupted, but there is no visible motion. The extravasation has disappeared. No change in the ophthalmoscopic appearances of the right eye.

Sept. 8th.—During the last few days the patient could not be examined because of great weakness. There is but little cloudiness of the retina. The red spot in the vicinity of the macula could only be recognized as an indistinct, brownish-red patch. The macula was surrounded by numerous small shining specks. All vessels narrower than normal, and filled with uninterrupted columns of blood. Patient thinks his power of vision in the right eye is normal. Ophthalmoscopic appearances in the right eye are the same.

Sept. 15th—Cloudiness of the retina in the left eye has disappeared.

Nov. 22d.—Left eye: papilla is pale, vessels considerably contracted, arterial pulse is easily produced. On the papilla is the yellowish-white spot already mentioned, which is concave anteriorly, with a turned-up edge. About the macula are light specks arranged in star-shaped groups. Right eye: the dazzling white spot is still present, except that the fundus seems normal.

Patient died on Dec. 1, 1883. Forty-eight hours later Prof. Schott made the autopsy, and found eccentric hypertrophy of the heart, with insufficiency and stenosis of the aortic valves, insufficiency of the mitral valves, hypertrophy of the lungs, infarctions in the spleen and left kidney, peritonitis, and ascites. The heart was twice the normal size and disc-like. The heart-muscle was

pale; the aortic valves were depressed, so that the greater part of the sinuses of Valsalva were exposed. The middle segment of the valve was represented by a band about 3 *mm.* wide, on whose free margin there were proliferations the size of a pea, coarse to the touch. On the right segment there were numerous coarse, pale-yellow proliferations, like a cock's comb, below which was a rent about 4 *mm.* long by 3 *mm.* wide.

In the spleen were found six infarctions, some very red, some yellowish-red, and some of a light-yellow color. On the convex edge of the left kidney was a cicatricial contraction, corresponding to an old infarction.

The bulbs of the eyes were removed together with the optic nerve as far as the chiasm, preserved in Müller's fluid, hardened in alcohol, and by means of the microtome were divided in an uninterrupted series of sections. Microscopic examination resulted as follows:

1. In the central artery of the intra-ocular part of the left nerve, just at the lamina cribrosa, was an embolus, whose long diameter was about twice the transverse diameter of the artery. It was partly hyaline, partly finely granular, and contained no cellular elements. It stained an even blue with hæmatoxylin. One part of the upper surface of the embolus had become attached to the wall of the vessel against which it rested; another part projected into the lumen of the artery, surrounded by blood. From that part of the arterial wall on which the embolus rested, the endothelium grew into the recesses existing between the upper and lower ends of the plug and the arterial walls, and was continued over the upper surface of the plug in a double or triple layer of cells, covering the embolus, and there protecting it from direct contact with the blood. The passage for the blood alongside the embolus measured at its widest part about one third of the diameter of the artery. It was full of normal blood-corpuscles, which seemed to form a continuous layer with those above and below the embolus. The two outer arterial coats presented no anomaly in the central arteries. Behind the embolus the lumen of the artery was normal.

2. In that part of the lower main branch of the central artery which passed over the papilla, was an embolus, which on section was of the shape of a long quadrangle, whose length was 0.16–0.20 *mm.*, and its width 0.025–0.050 *mm.*

Its relations to the lumen of the artery and to its endothelium

were similar to the one seen in the trunk of the central artery. The proliferation of the small endothelial cells was somewhat more copious than in the former. The muscular layer of the artery was not recognizable at the point of attachment of the embolus, the tunica adventitia was somewhat thickened and infiltrated by cells, and in the media there was found a lumpy product of arteritis.

3. In several small retinal arteries there was a considerable thickening of the wall with contraction of the lumen.

4. There was nothing abnormal in the veins of the optic nerve and retina.

5. In the optic papilla there was no dilatation of the vessels coming from the vascular corona of the sclerotic.

6. Beginning at the chiasm and extending to the bulb the left optic nerve was considerably thinner than the right.

Close behind the bulb the diameter of the left optic nerve was 2.112 *mm.*, that of the right one 2.912 *mm.* At the point of entrance of the central vessels the left measured 2.65 *mm.*, and the right 2.962 *mm.*, while in the optic canal the left nerve had a diameter of 2.35 *mm.*, and the right 3 *mm.* In the part anterior to the posterior layer of the cribriform plate the optic-nerve fibres presented other anomalies, and also various ones in the part lying between the cribriform plate and the chiasm. The optic-nerve fibres were entirely wanting in and anterior to the cribriform plate. From the posterior layer of this plate to the chiasm the bundles of optic nerves were attenuated and presented a grayish appearance. The color of the optic nerve was so changed that a transverse or longitudinal section of the diseased nerve could be distinguished from one of the healthy nerve by the naked eye at the first glance. No bundle of fibres was wanting, but all were so attenuated that a transverse section of the whole nerve seemed rather small even to the naked eye. The connective-tissue sheaths were too large for the bundles of fibres, and the spaces between the surface of the bundles of fibres and the intra-fascicular connective-tissue bands were enlarged, and the latter were bent and displaced. In longitudinal sections we completely missed the fibrillar plexus-like appearance of the normal optic nerve. The fibrillæ had degenerated into numerous small pieces, grains, and granules. There were no fat-granules present.

We find, therefore, that anterior to the posterior surface of the cribriform plate there was complete atrophy from incomplete blood supply, and from the above point to the chiasm there was simple

gray degeneration, which had ended in atrophy in consequence of the stoppage of the functional excitation from the periphery, although the circulation in this part was normal.

7. In the retina there was complete absence of the layers of nerve fibres and ganglion cells. The internal granule-layer was much thinner than normal, and in a large part of the lateral half of the retina it had been reduced to a single or perhaps double layer of granules. The outer granule-layer was normal, as was the layer of rods and cones, as far as could be judged from their defective preservation. The epithelial layer of the retina had, therefore, not suffered from the embolism of the central artery; the layers of nerve matter had disappeared.

If the autopsy had not been permitted, the diagnosis of embolism of the central retinal artery must have been made, judging from the sudden, complete, and lasting loss of sight and the severe degree of ischæmia which accompanied it, but the restoration of circulation could not have been explained. The anatomical examination of this case completely explains how the circulation was reëstablished, but it leaves us to consider the reasons for the sudden emptying of the retinal arteries, just after the embolus lodged, and also why sudden and lasting loss of sight occurred. Why did the retinal arteries collapse, if the passage alongside the embolus in the main trunk was wide enough to normally fill them with blood, and why were the retinal arteries not immediately kept supplied with blood, as was the case eighteen hours later on? For fifteen hours all the papillary vessels were of a rosy color, it is true, but thin like threads. The vessels became larger at the edge of the papilla, but only in the arteries was the column of blood of a uniform color, while in the veins red and light-colored sections alternated. Nine hours later the arteries had reached a normal calibre, and were provided with reflexes; the blood in the veins had acquired a visible movement toward the centre of the papilla. Although no attempt was made by pressure on the eyeball to influence the circulatory conditions, there was no doubt, judging from what was observed in the veins, but that the blood was again circulating in the retinal vessels. It is therefore probable that

only a small quantity of blood could pass the embolus and supply the retinal vessels. The blood flowed slowly under slight pressure through the branches of the central artery, so slowly in fact that the movement of the blood in the veins could not be followed by the naked eye.

In v. Jaeger's remarkable case in which the division of the columns of blood into variously colored small cylinders was first noted, and in which the current had its proper direction, the slowness of the circulation was also shown by the venous hue assumed by the arterial blood [1]; in a case reported by Schneller, in which there was restoration of sight, the arteries for some time had the appearance of thin retinal veins.[2] The sudden diminution of the intravascular pressure immediately after the occurrence of the embolism necessarily caused the subsequent ischæmia. At the moment when the arterial tension was considerably decreased by the lodging of the embolus in the central artery, the natural tendency to contraction of the arteries is more than equal to the pressure of the blood, and, as a result, the arteries contract just as they do after death. Shortly before death the papilla becomes pale, the papillary vessels become attenuated, and immediately after death the arteries and veins (as far as the edge of the papilla) are converted into light-colored narrow bands, which often show a thin red line in their centre, but beyond the papillary margins they are still partially filled with blood. Knapp has already called attention to the great similarity between the ophthalmoscopic appearance of the retina after death and after embolism of the central artery.[3] Embolism may be followed, as has been suggested by v. Recklinghausen,[4] by a spasm of the muscular coat of the arteries. The explanation given above as to the cause of the primary ischæmia of the retina following partial embolism of the central retinal artery, also explains why the papillary portions of the branches of the central artery are

[1] Ueber Staar und Staaroperationen, p. 105.

[2] *L. c.*, p. 275.

[3] Embolism of a branch of the retinal art., etc. These ARCH., vol. i., No. 1, p. 64.

[4] Handbuch der allgemeinen Pathologie des Kreislaufes und der Ernæhrung. Deutsche Chirurgie, 2 und 3 Lief., p. 156.

the thinnest. These parts usually are the broadest and have the thickest walls, and therefore the muscular spasm of the artery should be very marked.

Immediately after the occurrence of a partial embolism in the trunk of the central artery, there are two causes which interrupt the circulation. One is the embolus itself, the other is the contraction of the walls of the arteries. The latter gradually disappears after lasting a few hours, and then the vessels gradually become filled again, soon being of normal calibre, without there having been any change in the character of the embolus itself. In the case mentioned previously, the refilling of the vessels took place between the twelfth and fifteenth hours after the embolus had appeared, and in the case we are just now discussing the retinal arteries had regained their normal diameter and reflex lines within two hours and a quarter after the embolism occurred.

Case 3.—P. Albert, æt. thirty-two, appeared on October 24, 1882, with the statement that on the morning of that day, at eight o'clock, while quietly walking along the street, he suddenly experienced a considerable disturbance of sight in the right eye, which, in the course of a minute, increased so that he could not distinguish light from dark. After the blindness had continued for one hour and a half, flashes of light began to appear before the eye, and quantitative sensation to light was present. After another hour and a half, when the patient appeared at the clinic, he could distinguish the place and also the shape of the windows. While waiting to be examined vision increased, and at 12 M. we found $V = \frac{1}{3}$. Snellen's test-types were read, but not easily and in their order, because, as the patient said, they only appeared in the "light moments," soon to disappear again. Jaeger No. 3 was easily read at a distance of 10 *cm.* The margins of the visual field were normal, but there was a central scotoma, in which the white leaf became indistinct, light and dark specks alternated with each other, *i. e.*, while the latter cleared up now and again, the formerly light ones became cloudy. This scotoma, whose illumination was not steady for one moment, extended in all directions about 10–15° beyond the centre of the visual field. To the right eye all the samples in Daae's worsted-test seemed fainter, while blue seemed to be a marked gray. Every time the patient

viewed the blue test alternately with the right and left eye, he asserted that the right eye could distinguish no trace of blue, but that every thing seemed to be gray.[1]

With Förster's photometer we found in the left, healthy, eye, D = 1 *mm.;* in the right, D = 3 *mm.* Ophthalmoscopically, only a slight decrease in the transparency of the retina in comparison with the left eye could be made out, but it could not be stated positively that this was pathological. At one o'clock the patient left the clinic. Fifteen minutes later the right eye again became completely blind. At a quarter past three the patient again presented himself. Amaurosis. Tension somewhat above normal. Papilla was pale, and on the surface still had a slight rosy shimmer. The arteries were of normal diameter, and had well-marked reflexes. After the arteries had passed beyond the papilla, their walls became visible as two bright, white lines. The margins of these white lines were not always parallel to the margins of the columns of blood, but in many places the whitish color spread out and sent rays into the neighborhood. In the centre the retinal veins were very imperfectly filled, dark without reflexes, and the parts resting on the papilla were hardly recognizable. Beyond the margin of the papilla the retinal veins became larger, but only seemed to be of nominal size at a distance of about two diameters of the papilla from the edge of the disc. Close by the papilla the veins were very irregularly filled, diminishing in size in places until they were like threads, then becoming wider, and again contracting excessively. This condition was particularly marked in the vein coming from the upper, outer direction, the edge of the blood column in this vein being angular in places. The walls of the veins were not visible. The slightest pressure on the eyeball was followed by diminution in size or complete disappearance of the columns of blood in the arteries. No arterial pulse could be produced. The fovea centralis could be recognized distinctly by

[1] The presence of central scotomata with embolism is often mentioned. In one case Jeaffreson saw the darkening begin in the centre and rapidly spread to the periphery.[1] Ten days after embolism, Schön found a scotoma in the visual field of the affected eye.[2] The scotoma disappeared gradually, but could still be distinguished three weeks after the embolism had occurred, vision havtng meanwhile increased to counting fingers at twelve feet. Eales mentions a case in which the circulation became normal within a few hours, leaving a prominent central scotoma.[3]

[1] *Brit. Med. Jour.*, Bd. ii., p. 231, 1871. Cit. by Schön: Lehre vom Gesichtsfelde, p. 101.
[2] Lehre vom Gesichtsfelde, etc., p. 94.
[3] Embolism of arteria centralis; reestablishment of circulation; restoration of vision; permanent central scotoma. *The Ophth. Review*, edited by K. Grossmann & Priestley Smith, vol. i., Jan., 1882. *Centralb. für prakt. Augenheilk.*, 1882, p. 304.

its reflex, and was surrounded by an elliptic reddish-brown zone with indistinct margins ; its horizontal and vertical diameters were respectively $\frac{1}{3}$ and $\frac{1}{4}$ diameters of the papilla ; about this red-brown zone was an indistinctly outlined whitish cloudiness of the retina, on which fine retinal blood-vessels were distinctly visible.

The pulse was very strong—sixty-three per minute ; heart-impulse between the fifth and sixth ribs, heaving and diffusely broadened ; heart-dulness increased principally horizontally. Over all the valves was heard a systolic bruit, of maximum intensity at the apex. Bronchial catarrh. No albumen in the urine.

For one and one half hours the patient was closely watched, and during this time an increase in the retinal cloudiness was observed. Twice the patient inhaled amyl nitrite without any effect on the condition of the fundus.

Oct. 25th, 9 *a.m.*—All retinal vessels are of normal size in their whole course, and the white bands on either side of the arteries are only visible indistinctly here and there. There is venous pulsation, and on pressure on the globe an arterial pulsation is produced. The papilla is nearly of a normal red color, but its margins are indistinct. The retina about the papilla is clouded a grayish-white. In place of the reflex of the fovea centralis is a light spot, less light, but somewhat larger than the usual reflex. About this spot is a dark-red elliptic zone, and about this the whitish haziness which prevents the reflection of the choroid, but which forms a background on which the fine retinal vessels are seen. The light from the concave mirror is perceived, and its situation is correctly indicated. Occasionally the patient thinks that he can distinguish the outline of a human figure, the reflection from a face, or that he can distinguish the eye of a person.

At 3 P.M. the retinal cloudiness had again become more marked, and had acquired a greenish-white tinge. Fingers are counted at a distance of 30 *cm.;* the patient suddenly catches a glimpse of them as white bands and as suddenly loses them again.

Oct. 26th, 10 *a.m.*—The ophthalmoscopic appearances are the same, except that the light spot in the fovea has increased in size at the expense of the brownish-red zone. The tension which seemed slightly above normal yesterday now seems to be normal. Fingers are counted at about 40 *cm.*

Oct. 28th.—There is no spontaneous venous pulsation. The light spot in the retina has increased still more, the surrounding brownish-red zone being correspondingly smaller.

Oct. 30*th.*—The cloudiness about the papilla and macula is decreasing, so that the choroid makes its appearance. The papilla is acquiring a pale appearance. There is no change in the large vessels.

Nov. 1*st.*—The reddish-brown zone about the fovea centralis has become indistinct, and the light spot can hardly be seen.

Dec. 6, 1882.—The papilla is greenish-white, and reflects light strongly. All papillary vessels are greatly contracted, and along both sides of the columns of blood white bands are seen. Pressure on the eyeball causes an arterial pulse. At the lateral edge of the papilla a well-marked whitish foggy appearance is noted, of crescent shape, projecting beyond the papilla into the retina. Glistening specks are seen on various parts of the fundus near the papilla. Fingers are counted at 50 *cm.*, though only for a short time, as the patient is soon fatigued. Bright light pains the eye.

If case No. 2 prove that a high degree of ischæmia may follow embolism, although the embolus may not completely block the lumen of the vessel, then case 3 proves that sudden, complete, and lasting blindness (the small amount of vision remaining in case No. 3 may be left out of consideration) may follow embolism, notwithstanding the fact that enough of the lumen of the central vessel is patent to prevent a marked ischæmia, or that the latter is of so short a duration that the arteries are of normal diameter two and one quarter hours after the loss of vision. Whenever vision returns in an eye which has lost its power from embolism, we may be sure that the embolus only obstructs a part of the calibre of the vessel; but, on the other hand, it is not advisable to conclude that the whole lumen is occluded, even if vision is permanently lost. There is only one symptom which will decide whether an embolus partially or completely obstructs the flow of blood. The embolism is partial if, soon after it has occurred, there is a fulness of the vessels, or if circulation is present, as is indicated by the movement of blood in the right direction, or by the presence of spontaneous venous pulsation, or by the easily produced arterial pulse, or by the fact that the arteries, which may be emptied by pressure on the eyeball, are rapidly filled, beginning at the papillary centre, on relieving the

pressure on the globe. The presence or absence of vision is of secondary importance in this respect.

The loss of sight in case 3 cannot altogether be referred to sudden decrease in the amount of blood circulating in the retina, which amount, as is shown, could not have been very large, but in the great decrease in the tension of the blood in the retinal vessels, and the consequent decrease in the rapidity of the circulation, which did not provide sufficient nourishment for the retina. At the close of this article we will mention some of the remarkable cases of transient blindness which have so often been described as occurring in cases of embolism, but now we must discuss the probable cause of the sudden blindness, lasting two hours, which in case 3 preceded the permanent loss of sight caused by the embolism. If we are unwilling to assume that there is a cause for this loss of vision entirely distinct from the embolic processes, but which is still in so intimate relation to the latter that it only appears in individuals whose circulatory apparatus gives rise to symptoms of embolism, and even here only in those that at one time or another have embolism of the central artery, then we must also refer this transitory blindness to embolism of the central artery, just as we do the loss of vision which is permanent. It is a matter of regret that this patient was not examined during the period of transitory loss of vision. Mauthner examined a similar case, ophthalmoscopically, during the period of transient blindness, and found the symptoms characteristic of embolism.[1] He gave the most plausible explanation of all that are possible to account for the restoration of vision in his case. We cannot accept the same for our case, because it would compel us to suppose that a second embolus had blocked the calibre of the central artery two hours after the original embolus, which obstructed the origin of the central artery, had become dislodged. We cannot doubt the possibility of such an occurrence, but as we have to depend on inferences, we must prefer the most probable one, *i. e.*, that both losses of vision were caused by *one* embolus, and that the latter after lodging and remaining quies-

[1] *L. c.*, p. 5, des Separat-Abdrucks.

cent for two hours became dislodged by the blood current, and that the new position taken by it was one favorable to the nutrition of the retina, but that three hours later it was again moved and the permanent loss of vision followed. This explanation would be of but little importance if its only claim to credence were its apparent simplicity. We can refer to the support given this view by the peculiar manner in which the sight reappears, and still more so by the condition of vision between the transient and permanent loss of vision. Acuteness of central vision fluctuated greatly between wide margins, rising suddenly, like a tongue of flame to a considerable height, only to fall again until it was apparently extinguished; perception of light was decreased, and the function of the macula, which is most sensitive to insufficiency in the supply of blood, was greatly influenced. This condition of the visual power allows of the assumption of a changeable obstacle to the circulation in the central artery, in fact it seems to us that it can only be explained in this manner, and at the same time it also shows in what manner the function of the retina is influenced by slackening of the circulation. In case 3 this slackening of the circulation was shown ophthalmoscopically by the slight fulness of the veins on the papilla, by the varying breadth of the column of blood in the same vein, by the visibility of the arterial walls outside the papilla, and by the behavior of the papillary portions of the arteries on pressure on the eyeball. In an eye in which the central artery is partly closed by a plug, the intra-ocular pressure—that is, the pressure in the ciliary vascular system, must affect those retinal vessels most, in which the intravascular pressure is the lowest, and these of course are the papillary parts of the veins. It is in this manner that the tapering venous blood-columns, so often seen in such cases, are produced. The same appearances may be produced in the normal eye by pressing on the eyeball. In both cases it is caused by the preponderance of the pressure *on* the vessels, over the blood pressure *in* the vessels. In an eye with embolism, this excess in pressure is caused by the decrease of the pressure in the retinal vessels, and in the normal eye by the excessive pressure exerted *on* the vessels.

In the well-filled arteries, this decrease in the intravascular pressure was shown by the fact that pressure on the surface of the eyeball caused flattening and emptying of the papillary parts, without any arterial pulse appearing. Knapp (*l. c.*) thinks that in case pressure is applied the arterial pulse is only wanting after the vessels have become impervious, and that for this reason we may assume that they are so. We must dispute this assertion. Pressure on the eyeball, followed by success, proves the perviousness of the arteries, but failure to produce the arterial pulse does not show that the arteries are impervious. The arterial pulse cannot appear while the finger obstructs the lumen of the artery. In an eye with normal retinal circulation this occurs only when considerable force is used, while in an eye with a partly plugged central artery, causing decreased blood-pressure in the papillary arteries, it appears on very light pressure on the eyeball. In many cases of embolism of the central artery, followed by restoration of circulation, arterial pulse may be produced by applying the fingers very lightly, and thus avoiding compression of the lumen of the arteries,—Meyerhoefer mentions such a case,[1]—but in others even the lightest pressure causes emptying of the arteries, and the attempt at artificial production of the pulse fails. We will report on several cases of this kind. When, for various reasons, the blood pressure is low in the retinal arteries, the same behavior is noticed on pressure on the eyeball, as is the case in partial embolism of the central artery. Von Graefe noticed that in cholera patients light pressure on the eyeball produced a pulse, while a much greater pressure, which normally would not have sufficed to cause a pulse, produced permanent emptying of the arteries, and that in other cases in which the heart had lost its power in the highest degree, slight pressure emptied the smaller retinal vessels without causing any pulse at all.[2]

The sudden diminution of the intraretinal quantity of blood, together with the decrease of the tension of the

[1] Ueber Embolie der Art. cent., Ret., Inaug.-Dissert., Kœnigsberg, 1873, p. 15.

[2] Ophthalmologische Beobachtungen bei Cholera, *v. Graefe's Archiv*, Bd. xii., 2, pages 208–9.

retinal blood, not only destroys the function of the retinal but is also followed by atrophy of the retinal elements which are nourished by the blood from the central artery. We will first consider the changes produced by partial plugging of the central artery, as they are shown in its visible branches. Why did the retinal vessels waste away with the same rapidity as in cases of ordinary (complete) embolism, although they contained an almost normal quantity of blood soon—namely, in Case 2 twenty-four, in Case 3 two, hours after the entrance of the embolus? One can easily imagine that an ischæmia of high degree, although it may be transient, may totally destroy the function of the retina, but if, later on, the refilled arterial system, which may remain so for several days or weeks, undergoes the highest degree of atrophy, we cannot consider the same as a result of the transient anæmia. As we have already stated, this atrophy of the vascular system of the retina is entirely unreconcilable with the assumption that the refilling of the retinal vessels, which takes place between the time of the primary ischæmia and the final atrophy of the vessels, is caused by vessels connecting the central and ciliary vascular systems. If, after embolism of the central artery, the retina were supplied with blood in this manner, atrophy of the same would certainly not take place. If, on the contrary, the retinal arteries are supplied by that part of the central trunk which is not obstructed, the slight tension of the blood (which is just enough to keep the vessels patent) is not high enough to fill the non-visible capillary arteries with rapidly circulating blood. Their walls are thin, poorly nourished, and atrophy, causing a narrowing of the lumen, and augmenting the already existing obstructions to circulation. The rapidity as well as the intraretinal quantity of blood decrease, and the atrophy progresses gradually from the finest vessels toward the central artery.

The **changes** which take place **in the retinal tissue proper, after embolism** of the central artery, have not up to the present been satisfactorily investigated, as no opportunity had occurred of making an anatomical examination shortly

after the embolus had lodged. We only know that in embolism of the central artery the retina acquires a grayish cloudiness, and that the latter, if the embolism be of short duration, may disappear without leaving a trace in the retina, which again acquires its normal function; but in permanent embolism the cloudiness may increase to total opaqueness of the affected parts, which assume a greenish or bluish-white color, and is also often combined with retinal hemorrhages, and finally complete atrophy of the cerebral layer of the retina takes place. Judging from the behavior of the cloudiness in the region of the macula lutea and the fovea centralis, we may conclude that it is situated in the anterior or cerebral layers of the retina. Death of the part is the result of course of a sudden complete or nearly complete stoppage of circulation, and we will certainly be in complete sympathy with the sense and nomenclature of general pathology, if we designate as necrosis, the group of symptoms, such as cloudiness, swelling and atrophy of the retina, which follow embolism, although the size of the organ affected, and the fact that in many cases the preservation of a slight degree of circulation cause an appearance which is very different from that presented by necrosis of larger, prevalently fibrous organs. Leber declares that the whole retina is not implicated in the necrosis, because the choroidal capillaries also take part in nourishing the retina.[1] This explanation is certainly correct but entirely superfluous, because the central artery nourishes the cerebral retinal layer only, and therefore only this portion will necrose after embolism of that artery. A necrosis of the posterior retinal layers need not be expected; its occurrence, not its absence, would demand an explanation.

Since Cohnheim's investigations in regard to embolism have become known, ophthalmologists have endeavored to make a comparison between the group of clinical symptoms following embolism of the central artery, with that shown by Cohnheim to be typical of a complete occlusion of a terminal artery. If we premise that Cohnheim's view is the correct one, we cannot be surprised to find that hemor-

[1] Graefe and Sæmisch's "Handbuch," Bd. v., 2, p. 547.

rhagic infarction does not appear in those cases of central embolism in which visible normal circulation, repletion of the arteries with bright-red blood, appearance of arterial pulse on slight pressure on the eyeball, or spontaneous venous pulsation are observed. In these cases—and they form the majority of all heretofore described—the *conditio sine qua non* of hemorrhagic infarction, the complete closure of the central artery, as is meant by Cohnheim, is wanting, and the variations, as shown by the ophthalmoscope, from the changes given by Cohnheim, as usual, after complete obstruction of a terminal artery, must be considered as testimony in favor of, rather than against, Cohnheim's views.

Von Recklinghausen states that retinal hemorrhages are more frequent and copious when embolism of an arterial branch takes place than when the main trunk is affected, and explains this by saying that in the first case, the blood from the neighboring unobstructed capillaries rushes into the ischæmic region quite rapidly, causing hemorrhages, while in the latter case, the collateral circulation can only take place through the connecting capillaries of the vascular corona of the sclera, and that the vessels of the ischæmic region are only partially filled. The correctness of this view, advocated by v. Recklinghausen, is not above all doubt. Among thirty-two clinical histories of such cases, which were carefully observed from the beginning, mention is made of the occurrence of hemorrhages in sixteen of them. Of the thirty-two cases, twenty-seven are cases of embolism of the central vessel, and five of some branch of the same: among the twenty-seven cases there was retinal hemorrhage in fourteen; and among the five cases of embolism of a branch, only two cases had hemorrhages. If we include six cases observed by us, all examined shortly after the embolism occurred, we have altogether thirty-one cases of embolism of the central trunk with fifteen cases of hemorrhage, and seven cases of embolism of some lateral branch with three cases of retinal hemorrhage. The percentage of retinal hemorrhage is, therefore, about the same in both categories. In examining the literature of the subject, it is more difficult to

form an opinion as to the intensity of the hemorrhages. The most copious hemorrhage in embolism, so far reported, occurred in the case of embolism of a branch of the central artery, reported by Knapp, which he thinks (*l. c.*) to be a case of hemorrhagic infarction of the retina.

Considering the fact that in one half of the reported cases of embolism of a branch of the central artery, there was no retinal hemorrhage at all, and that in one case of embolism of the central artery, which will be described immediately, there was as copious hemorrhage as in Knapp's case, it seems hardly justifiable, at present, to assume that there is more probability of retinal hemorrhage taking place in embolism of the branches, than of the central artery itself.

Before expressing our opinion as to the causation of these hemorrhages, we will first describe the two cases, from the observation of which we have formed our opinion.

Case 4.—N—— Franz, aged thirty, became blind in the left eye, twice during the year 1873. On Dec. 8, 1874, there was again a sudden loss of vision of the left eye, this partially disappearing in the course of seven hours, but in the course of the next two hours again appeared, and became permanent. On Dec. 15, 1874, the patient was admitted to Jaeger's clinic. The papilla was pale, the retina cloudy, and from the papilla to the fovea centralis it was entirely opaque, bluish-white, and had a shining appearance. The veins appeared to be normal. On the papilla, and for two or three diameters beyond its border, the blood columns in the arteries were very small, but farther on the arteries were better filled. Both of the large arteries which surrounded the macula, acquired normal fulness by the time they reached the region of the macula, to which they supplied numerous well-filled small branches, which were very distinct on the bright background. Several of these small vessels passed through circular extravasations of blood, or seemed to terminate in them. Other extravasations were seen between the papilla and the macula, and in the latter without apparent connection with vessels. The fovea centralis was represented by a dark spot on a white ground. On the nasal side of the papilla the vessels were filled to a greater degree, no extravasations were present, and the yellowish-red of the choroid was seen through the cloudy retina. Pressure did not produce arterial pulsation. Tension was normal. Amaurosis. Insufficiency of the bicuspid valve. Hypertrophy of the heart.

Dec. 18, 1874.—Filling of the arteries has proceeded towards the margin of the papilla. On slightest pressure on the eyeball, the central sections of the veins become empty, and on increasing the pressure, arterial pulse appears. The number of hemorrhages has increased. In place of the thin extravasations between the papilla and the macula are seen a large number of small, brightly shining specks. The retina is becoming grayish-white, and has lost some of its brightness.

Dec. 21*st.*—The brightly shining specks have multiplied, the extravasations have increased, the retina has become less transparent, and the arteries are filled to a greater extent. Spontaneous venous pulse is present, and arterial pulse is easily produced.

Dec. 27*th.*—Only the artery passing downward and outward is abnormally full. On the papilla it contains a thread of blood, and then for the distance of half a papilla-diameter it seems empty, after which it again assumes its normal size. The light specks have increased in number; some of them are bright, others of a dead-white color. They appear only in extravasations of slight depth, and have a distinct parallactic displacement.

Dec. 30*th.*—The edges of a large extravasation in the region of the macula are surrounded by a bright-white margin.

Jan. 9*th*, 1875.—Up to the present time new extravasations have been appearing in and about the region of the macula. At the same time the older ones retrograded, and small white spots appeared in them, situated on the surface. Arterial pulse is still easily produced.

Jan. 15*th.*—There is already a general well-marked contraction of the arterial system.

Feb. 10*th.*—All extravasations have disappeared. The small white specks still are present. The retinal cloudiness has not entirely disappeared.

July 13*th.*—The papilla is bright white, flecked with green. Vessels are very narrow, the numerous small vessels in the macula region have disappeared and left no trace. Pressure on the eyeball produces arterial pulsation. The whitish spots are not visible, but in their place the background is somewhat lighter than normal.

Case 5.—Anna R., aged twenty-five, has been treated by Prof. Loebel, in the General Hospital of Vienna, for insufficiency of the bicuspid valve. At 2 P. M., on July 14, 1875, the patient, who was lying quietly in bed, noticed that things suddenly began to

tremble, after which she became entirely blind in both eyes. After a short time vision was restored in the left eye, while the right remained blind for a quarter of an hour. After this time the loss of vision disappeared in the upper half of the visual field ; in the lower half no further change took place. On July 15th, at 3 P. M., the patient was examined ophthalmoscopically for the first time. The inner-upper part of the papilla was pale, but the whole lower half was of normal color. The papillary margins were indistinct. The main branch of the central artery, which passes upward, was invisible ; its two branches, which are given off near the edge of the papilla, were very small. The remaining vessels were normal. The whole upper half of the retina, down to the papilla, was a greenish white, totally opaque, and separated from the normal, transparent half of the retina by a very sharply defined line. This dividing line nearly corresponds with a horizontal line through the centre of the papilla, rising above the latter in the lateral part, so that the macula lies below it in the comparatively healthy part of the retina.

July 16th.—The upper half of the retina has become of a more intense green, particularly in the lateral parts. The margin of the greenish discoloration is irregular, forming tongue-like projections along the vessels. The lower half of the retina is somewhat clouded. Papilla and vessels same as yesterday. In the upper half of the visual field fingers may be counted at 15′, while the lower half shows no perception to light. The sharply defined line corresponds to the horizontal dividing line of the visual field. Closer examination of the vision is impossible because of the dropsy, etc., of the patient.

July 17th.—Extending in a radial direction and across the lateral margin of the papilla is an extravasation about one half a papilla-diameter in length.

July 18th.—The upper main branch of the central artery is again filled with blood ; its two branches, also, which are somewhat thinner than normal, and their walls are not parallel in all places. On pressing on the eyeball pulsation is seen in the upper artery (up to the present pulsation could only be produced in the lower main branch). On the papilla, above the main arterial branch, is a round white spot. The extravasation which appeared yesterday has grown, a second one has appeared lying alongside a vein, and a third disc-shaped one is seen in the region of the macula. The

latter is considerably larger than the papilla and lies in front of the retinal vessels in the lower nearly normal portion of the retina; its upper edge being separated from the edge of the greenish half of the retina, by a narrow margin of red fundus. A fourth circular extravasation, of about one fifth the diameter of the papilla, lies between the latter and the large extravasation.

July 19th.—On pressure, pulsation in the upper main branch is now as marked as in the lower, while yesterday it was more indistinct. The lower half of the retina has become somewhat more clouded, and in the upper opaque portion new extravasations have appeared, of which one is about one fifth the diameter of the papilla and is traversed by a small vein. The white spot above the upper main branch is bright, lies near the edge of the papilla, anterior to the division of the artery, covering it so that only a small strip of the column of blood is seen at the edge of the vessel. Of the two branches of the upper trunk, that going inwards is normal, while that passing upwards and outwards is very narrow from its commencement, and assumes its normal diameter at a distance of about two and one half diameters of the papilla. At various points the lumen of the contracted part varies, in that comparatively wide portions are placed between contracted parts, and *vice-versa*. Just over the part where this artery becomes normal lies a white spot similar to that over the main trunk. One of the extravasations has become larger.

July 24th.—The visual field has become larger, and vision has become more acute. The retinal cloudiness has decreased, and has begun to lose its sharply defined margins and its shimmer. The small artery passing upward and outward is more evenly filled, but has not yet acquired its normal appearance. The extravasations have become smaller.

July 27th.—The lower half of the retina has become nearly normal; the upper portion is losing more and more of its brightness, opacity, and greenish tinge. The dividing line between the two is disappearing, as is the case also with the extravasations.

July 29th.—The upper main branch of the artery, with its two divisions, have become thinner by one half than the corresponding vessels below, and have lost their reflexes. Arterial pulsation may be easily produced in them. The upper half of the papilla is transparent and nearly white. The light, round spot on the papilla, which covered the nasal half of the main arterial branch, and prevented the blood column from being seen, has now become

distinctly visible. The spot over the artery passing upward and outward is white, sharply defined, much smaller than the one just described, is of irregular shape, and permits the vessel beneath it to be seen through it. There are but slight traces of the extravasation.

On August 3d the patient died.

In both these cases the emboli did not completely block the vessel. The hemorrhages began when normal circulation began to be restored, and increased considerably after the circulation had increased so that an arterial pulse could be produced, and lasted longer in case 4, in which the pulse appeared later than usual. Most of the extravasations were of but slight depth, and were situated superficially. The situation of the large extravasation in case 5 could be estimated from its relations to the retinal vessels; in case 4 the same could be estimated with great probability that they disappeared only after previously forming glittering dots, numerous round, apparently perforating defects and white shining seams, which processes are usually noticed in the large disc-like extravasations between the retina and the vitreous. The principal situation of the hemorrhages was in the region of the macula, where the vessels are particularly delicate, and where, as is well known, hemorrhages very often take place in other diseases of the retina. The hemorrhages therefore occurred as the blood regained its tension—although still below normal,—and passed into the slightly-filled vascular area, either because the vascular walls had become degenerated in consequence of deficient nutrition, as is assumed by Virchow and Cohnheim, or because the smaller vessels had become blocked by coagula, as is assumed by Knapp and v. Recklinghausen. In case 5 the largest extravasation did not lie in the greenish-white part of the retina, but in the part which was comparatively normal.

But it does not follow from this circumstance that the hemorrhages resulted from collateral hyperæmia in the vessels next the one which was obstructed, for they appeared after the latter had again become filled with blood, had pulsated on pressure, and also because the artery passing above the macula (a branch of the plugged vessel) supplied

a large number of small vessels to it, and therefore the extravasation may be referred to the blocked artery, although it lay in the transparent half of the retina.

I had been familiar with the ophthalmoscopic appearances of incomplete embolism long before the anatomical examination of case 2 explained the cause. The sharply defined white spots present so peculiar an appearance in their relation to the retinal vessels, that from the first examination of such a spot (in case 5) I formed the opinion that it was necessarily connected with the embolic process, and in the following case made use of this fact, although I must reject the probability that the white spot represented the ophthalmoscopic appearance of the embolus itself. But as I often noticed the blood circulating in vessels below and alongside the white spot, sometimes behind it also, but never in front of it, leaving no doubt as to the presence of normal circulation, I could not imagine that an incomplete plug could remain for weeks and months in a narrow vessel without increasing by the deposit of coagulated material until circulation was entirely obstructed; and as the white spots appeared like scales or leaflets, the reflex of the vascular walls being wanting where they were present, I came to the conclusion they were circumscribed deposits on or in the vascular walls, caused by the presence of the embolus, in some manner not yet understood.

Case 6.—L—— Martin, aged twenty-five, came to v. Jaeger's clinic on Aug 1, '75, complaining of disturbance of vision of the left eye. The shape and color of the papilla were normal, as were the distribution, number, and diameter of the papillary and retinal vessels. In the inner-upper quadrant of the papilla, near the entrance of the large vessels, and just anterior to the division of the upper main arterial branch, lies a white, very bright, apparently slightly depressed, sharply outlined, round spot, which in places allows the edges of the blood column to appear indistinctly. Externally, and below the papilla, distant from its edge about one and a half papilla-diameters, is a similar spot, about half as large as the one described, situated on and completely covering an artery. The presence of these spots was in favor of embolism. The causation was also in favor of this view. It was found that

the visual disturbance had appeared suddenly three months previously, while the patient was quietly sitting in his room. It suddenly began to scintillate in front of both eyes ; five minutes later vision was again normal in the right eye, but the left one was deficient, and has remained unchanged since. The visual field is deficient, the inner-lower quadrant and the inner half of the lower, lateral quadrant being completely wanting ; the remaining part of the visual field is contracted from the periphery. At a distance of 12″ the field is as follows (on a flat surface) : Upward 15″, upward and inward 17″, inward 7″, downward and inward 0″, downward 0″, downward and outward 12″, outward 12″, outward and upward $20\frac{1}{2}$″. V = $\frac{3}{15}$, but the letters are not read easily, the patient pausing between the letters to enable him to bring his eye in line again. Only the first words of each line are read ; he says he cannot "take in at one time" the long words.

The patient appears to be quite robust, and aside from his eye trouble considers himself quite healthy ; has never had palpitation or difficult respiration, but has a well-marked stenosis of the aortic valves. After a diagnosis of embolism of the upper main branch of the central artery had been made, based on the above facts, I showed by ophthalmoscopic examination that it was impossible to produce pulsation in the two superior papillary arteries. While pulsation appeared in the main artery and its branches extending downward, the upper arteries became smaller, and at last entirely empty. Finally it was seen that that part of the retinal artery lying anterior to the white spot was somewhat narrower than the part anterior to it ; this affected only a piece about half the length of a diameter of the papilla.

Among the nine cases of embolism which we have examined, there were four in which the ophthalmoscope showed the incompleteness of the emboli. Two of these cases consisted of two emboli each ; the whole number of emboli which were seen with the opthalmoscope was therefore six. In case 2, each eye contained an incomplete[1] embolus, visible during life, and a third in the trunk of the left arteria centralis retinæ. These facts alone suffice to show that incomplete emboli in the retinal arteries are not uncommon.

[1] It seems that Leber and Hirschberg also saw incomplete emboli with the ophthalmoscope. Gräfe and Sämisch's "Handbuch der Augenheilkunde," Bd. v., p. 544 ; and *Centralblatt für prakt. Augenheilk.*, 1884, p. 3.

Further investigations will discover the relative frequency of this variety of embolism; but even at this moment we are justified in saying that its frequency is such, that in explaining the clinical symptoms presented by embolism, it must be taken into consideration.

In closing, we shall discuss the points which our cases present regarding those transient losses of vision which are so often touched on in the literature of embolic diseases of the retina. Among the ninety-four cases published to date, there are nineteen in which mention is made of transient loss of sight; and among eight cases seen by us, there was transitory loss of sight in all but two. We find, therefore, that among 102 cases there are twenty-five in which, besides the loss of sight, due without doubt to the embolus, there were one or more attacks of loss of vision, appearing suddenly and lasting but a short time. If we arrange these remarkable transitory losses of sight according to the extent of retina involved, and to their relation to the loss of sight caused by the embolus, we find they come under the following categories:

1. The transitory loss of sight involves only a part of the visual field of one eye; simultaneously with this, permanent loss of sight affects the remainder of the field from embolism of a branch of the central artery.[1]

2. Transitory loss of vision extends over the whole visual field of one eye:

a. Later on this eye sustains permanent loss of sight from embolism of the central artery,—

α but few hours after transitory loss of vision[2];

β some weeks or months later.[3]

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[1] Knapp: Embolism of branches of the ret. art. These ARCH., Vol. iii., No. 1, p. 36; 2 cases. Landesberg: *Ibidem*, p. 58, 2 cases. Mauthner: Zur Lehre von der Embolie der Art. cent. Ret., *Wiener med. Jahresberichte*, 1873, Separat-Abdruck, p. 15. Nettleship: Embolism of branch of art. cent. ret., *Lancet*, 1875, 2, p. 491. Swanzy & Fitzgerald: Case of embolism of a branch of central artery of retina, *Dublin Journal of Med.*, 1876, p. 225. Altogether 7 cases.

[2] Liebreich: "Ophthalmoscop. Atlas," p. 15. Von Stellwag: "Abhandlungen aus dem Gebiete der prakt. Augenheilk.," 1882, p. 253. Unsere Fälle 3 und 4. Together, 4 Fälle.

[3] Mauthner: "Lehrbuch der Ophthalmoscop.," p. 342. (This case is the same as the one described in Jäger's "Atlas," p. 113.) Schneller: Fall von Em-

b. The eye of the other side was—

α previously and permanently blind from embolism;[1]

β or became permanently blind by embolism at the moment the other eye was affected with transitory loss of sight.[2]

3. The entire visual field of one eye and a portion of that of the other lose vision temporarily, while the remainder becomes permanently blind from subsequent embolism of a branch of the central artery.[3]

4. The transitory blindness affects both eyes simultaneously; one becomes permanently blind later from embolism of the central trunk.[4]

These transient losses of vision have so much in common with those caused by embolism, that there is great probability that they are caused by an embolus which lasts but a short time. This supposition is further rendered more probable by the fact that in a case of transient blindness Mauthner observed the opthalmoscopic symptoms common to embolism. We can also refer to cases in which an ophthalmoscopic examination, after a return of vision, showed the presence of a small incomplete embolus in one of the retinal arteries of the eye which had temporarily lost its sight. (Right eye in case 2.) It is therefore proved that those losses of sight are of embolic origin, and that they disappear after the embolus is driven out of the main trunk into one of the smaller branches, where it remains without causing much if any mischief.

The last and very important fact is demonstrated by case

bolie der Art. cent. Ret. mit Ausgang in Besserung (pp. 14), *Arch. f. Ophthalm.*, Bd. viii., 1, p. 27. v. Wecker: "Traité des maladies du fond de l'œil," etc., 1870, p. 250. Fano: *Annales d'oculist.*, Bd. liii., p. 240 (23 years). Haase: Zur Embolie der Art. cent. Ret.," *Archiv f. Augenheilk.*, Bd. x., p. 474 (½ jahr.). Hirschberg: Zur Embolie der Art. cent. Ret., *Centralblatt fur prakt. Augenheilk.*, 1884, p. 2 (4 Wochen). Knapp: *Archiv f. Ophthalm.*, Bd. xiv., p. 212. Together, 7 Fälle.

[1] Our case 2.

[2] Nettleship: *Nagel's Jahresbericht*, 1874, p. 403.

[3] Barkan: Embolism of a branch of the ret. art. These ARCH., iii., 1, 33. Knapp: *l. c.* Our cases 5 and 6. Together, 4 Fälle.

[4] V. Stellwag: "Abhandlungen aus dem Gebiete der prakt. Augenheilk.," p. 275. Several of the cases recorded in literature might have been classified among one of the above categories. We have, however, mentioned each case but once.

6. In this case both eyes became blind at first, but the only permanent loss of vision was in a part of the left eye. The ophthalmoscope showed an embolus in the artery supplying this part of the retina, but an incomplete embolus was also seen in an artery supplying a part of the retina which still retained its function. It is a well-known fact that complete loss of vision may finally result in loss of sight of a portion of the retina, in case the embolus is driven from the main trunk into one of its branches; but the fact that emboli may get into the lumen of retinal arteries without causing blindness of the corresponding retinal divisions is a new observation, and of much importance in explaining the disappearance of losses of sight caused by emboli.

After having seen that incomplete emboli are not at all uncommon, and after cases 5 and 6 have shown that emboli are detached from their original resting-places in the lumen of the main trunk, divided in several pieces, and lodged in several retinal arteries, and, finally, that incomplete emboli may remain in retinal arteries without marked detriment to the function of the retina, we may then venture to explain the complete disappearance of embolic losses of sight by the entrance of the pieces of the embolus into peripheral retinal arteries of small calibre. But at present we may doubt that incomplete emboli, be they never so small, can remain in retinal vessels without causing some disturbance. We know, however, that they may be present without causing much disturbance. But the assumption that they may be present without causing the slighest disturbance of function is only based on the statements of the patients that, after the disappearance of the blindness, the eye recovered the same degree of vision it had formerly enjoyed. It is quite probable that a close examination of the supposed normal vision would show a contraction of the visual field or a diminution of the perception of light. In case 6 the borders of the retained part of the visual field had moved toward the centre, and it is but right to suppose that this symptom had some connection with the presence of minute emboli in the fine arteries of the anterior portions of the retina.

It is not necessary to imagine that both emboli, which in

two of our cases were in different retinal arteries, belonged to one mass, which was finally divided by the current of blood in the central artery. It is just as probable that they were already divided when they reached the central artery, or that at least they arrived almost simultaneously. By following this assumption further, we may imagine that a sort of embolic dust is washed from the soft growths on the valves by the current of blood, enters one or both carotids, then into the central retinal arteries, resulting in uni- or bilateral blindness, which may entirely or partly disappear as soon as the minute particles have been distributed among the branches of the central artery.

All the transient losses of sight, which are separated from the permanent loss of sight of the same eye caused by embolism, must be referred to separate emboli; but those cases, on the contrary, in which the function of the retina is lost permanently a few hours after the disappearance of the temporary blindness, permit us to assume that an embolus which had lodged in the central artery had become loosened by the blood current, thus restoring the retinal function, which is again lost in a short time. In consideration of this fact, the subdivision 2, a in the classification given should again be divided into two sections. Our case number 3 may be taken as a type of those belonging under 2, *a*, *α*. From the history of this case we see that turning of the embolus may restore, as well as destroy, the function of the eye, and that the mechanical influence on the embolus lying in the lumen of the central artery, which may be expected in many cases from iridectomy or sclerotomy, may cause the destruction of the eye.

NINE SUCCESSIVE CASES IN WHICH THE ELECTRO-MAGNET WAS USED FOR THE REMOVAL OF FRAGMENTS OF IRON FROM THE INTERIOR OF THE EYE.

By H. KNAPP.[1]

A FEW months ago, when I received Hirschberg's interesting monograph on the use of the electro-magnet in ophthalmic surgery, I was astonished to see that he had made as many as thirty-three "magnet-operations." Being under the impression that my personal experience was much less, yet remembering some noteworthy observations, I perused the in-door books of the New York Ophthalmic and Aural Institute, from January, 1882, to June 30th, 1885, and found that the electro-magnet had been used in nine cases during the last 3½ years. The results were as follows: In two cases chips of iron were removed from the iris with the combined aid of magnet, hook, and forceps. Recovery of eye and sight perfect. In the seven remaining cases the fragments of iron were in the vitreous, and though in none of them they could be seen, in four of them they were successfully removed with the magnet, the eyes recovering by first intention without reaction. They all had traumatic cataract from the passage of the foreign body through the lens. In three of them the attempts at extracting the foreign body with the magnet failed, and the eyes were enucleated at once. I shall first describe the two cases of pieces of steel in the iris.

[1] A short abstract of this paper was presented to the Am. Ophthal. Soc., July 15, '85.

CASE 1.—*Piece of steel, twenty-four hours in iris, enveloped by lymphatic exudation. Removal. Recovery.*

Fred. H., æt. twenty-eight, Weehawken. On the morning of April 13, 1882, a small foreign body (steel or iron) entered through the upper-outer quadrant of the cornea, and lodged in the iris, where it could easily be detected. It was embedded in a whitish exudation.

A small corneal incision was made above it with a Graefe's knife. The magnet, then introduced, failed. A hook, inserted and passed with gentle pressure through the white substance, laid the foreign body bare. The magnet, re-introduced, drew the piece of steel into the wound, from which it was scooped out. No iris removed, pupil round.

No irritation. A small anterior synechia formed at the wound. It was broken by eserine, instilled morning and evening, in three days. Patient discharged on fifth day; iris, pupil, and sight normal.

CASE 2.—*Chip of steel,* **seventeen years in iris.** *Removal. Recovery.*

Thos. D., æt. sixty-five, Waterbury, Ct. Seventeen years ago, while he was knocking the hoop off a sugar-barrel, a piece of the nail-head flew in his right eye. He was laid up for two months on account of severe inflammation of the eye. In a few weeks the other eye became likewise inflamed, but soon recovered. The right eye has had defective sight, but kept free from irritation until a year ago, when it "had a short spell (two or three days) of inflammation." During the four weeks before the patient came to consult me, he had several such attacks. I found a brown foreign body, about the size of a pin-head, sticking in, and projecting over, the inner part of the iris, 1.5 *mm.* from the free edge. The eye not irritated. Some irregular opacities in the crystalline lens. The pupil moved freely, except that part in which the foreign body was lodged. V = $\frac{20}{200}$. F complete. Tn. Though the foreign body, after wounding the cornea, iris, and anterior capsule, had been exceedingly good-natured in keeping quiet so long, I thought it best not to trust it further.

May 30, 1885, the eye being cocainized, I made a small linear section near the margin of the cornea. The electro-magnet, introduced, drew the piece of steel near the wound, where it was seized with forceps, drawn out, and removed with a little piece of iris in

which it was embedded. A very small brown dot was noticed on the edge of the small coloboma, when the iris had resumed its position. It was seized with forceps and likewise removed.

Instilled atropine and cocaine. No reaction. The next day, the anterior chamber restored, the upper edge of the coloboma adhered to the cornea somewhat extensively, the lower to the capsule. Atropine and cocaine. The adhesions broke on the fourth day; pupil wide and free; lens the same. Patient discharged on eighth day, cured. Vision, as before, $\frac{20}{200}$.

The four cases in which fragments of IRON, though not seen, were successfully REMOVED FROM THE VITREOUS, are as follows:

CASE 3.—*Fragment of steel in vitreous. Removed on tenth day. Recovery.*

Thos. Z., æt. forty, of New York. A small piece of steel struck the upper-outer quadrant of the cornea, traversing the iris and lens downward and inward, but cannot be seen in the vitreous, as the lens has become too opaque, though the accident happened only a few hours before the patient came to the dispensary. He was admitted to the hospital at once. There was, during the next nine days, considerable pain and inflammation. F complete. T normal, and at times diminished. All along I advised enucleation, but the patient would not consent.

On the tenth day, when he could see only the movements of the hand, and the inflammation was unabated, I obtained from him the permission to try to extract the foreign body, and, in case of failure, immediately to remove the eye. He was put under ether, and a meridional section of 5‴ in length was made through conjunctiva and sclera in the outer-lower quadrant, posterior to the ciliary region. The wound was held open by squint hooks, a powerful electro-magnet (Hirschberg's) introduced, which, at the third attempt, brought out a piece of steel $2\frac{1}{2}$‴ long, 1‴ wide, $\frac{1}{2}$‴ thick.

The wound was united by conjunctival silk sutures; the eye bandaged.

Some circumorbital pain, œdema of conjunctiva, and slight mucous secretion followed for two days; then healing rapid. Patient was discharged a week after the operation. He showed himself from time to time. There was no irritation from the eye. S $\frac{1}{20}$.

F complete. He has not been seen for two years. I fear the eye has shrunken somewhat.

CASE 4.—*Piece of steel in vitreous, successfully removed.*

P. D. S., æt. twenty-two, of New Haven, Conn. A week before patient presented himself, on 2d of May, 1883, he was hammering steel, a chip of which flew into his eye. It could not be seen with the ophthalmoscope, the media being turbid, nor could its point of entrance be seen, but there was a small central opacity in the anterior part of the lens. Pupil wide. Saw only movements of the hand. Eye injected, but free from pain.

For nine days I kept the patient in bed, expecting the vitreous to clear up sufficiently to localize the foreign body. The pupil dilated *ad maximum*. May 11th, eighteen days after the accident, there was slight injection around the cornea, the iris was yellowish, the pupil had a greenish reflex; at the bottom of the vitreous a yellow patch moved with the eye, and was supposed to enclose the foreign body. T–1. Movements of hand seen only in lower and outer part of visual field.

I made an incision between external and inferior recti, 4‴ long. The electro-magnet brought out, at the first attempt, a piece of steel $\frac{1}{8}''$ long, $\frac{1}{16}''$ wide. Eye bandaged. Recovery undisturbed. Tension and aspect of eye became normal, except that a cataract slowly developed.

CASE 5.—*Particle of iron in vitreous, invisible. Removed with magnet. Recovery.*

Mr. B. A. C., of New London, Conn., consulted me, May 4, '84. stating that three days previously, while he was opening a keg of mackerel with a chisel, a piece flew off and struck his left eye, which lost sight at once, and inflamed rapidly. *St. pr.:* No pain; circumcorneal injection moderate; a small scar in cornea, a little above its centre; an opening in ant. lens capsule, behind the corneal scar. Cataract. Fundus not visible. Counts fingers at 1′. F complete; Tn. No tenderness on pressure.

Operated on the same day. Meridional incision between ext. and inf. recti; chip, about 1‴ by $\frac{1}{2}$‴, extracted with magnet at the second introduction; one suture applied.

The day after (*May 5th*) had only slight pain; pupil perfectly wide; slight chemosis.

May 6th.—Wound closing slowly, a little vitreous in it.

May 7th.—Improvement continues.

May 9th.—Pupil contracted, an adhesion above and below; atropine every two hours.

May 10th.—Pupil wide and round again.

May 13th.—Injection less, cataract does not progress; wound closed, but yet considerably raised.

May 16th.—Reaction subsiding; swelling of scar diminished.

May 20th.—Eye almost white. V = $\frac{3}{200}$. Discharged, May 22d.

Wrote, June 24, 1885, that, apart from the cataract, the eye was perfectly well, but when I saw him on a visit at his home, July 15, '85, I found the eye slightly shrunken, and a defect in the upper-inner part of the visual field.

In the following case, as in some of the preceding, enucleation had been advised. The patient presented himself in the service of Dr. T. R. Pooley, at the dispensary of the N. Y. Ophthalmic and Aural Institute, and was successfully operated on by him. I was present at the operation and watched the recovery. Dr. Pooley has kindly permitted me to insert a report of the case into this paper.

CASE 6.—*Fragment of steel, invisible in the vitreous, extracted with the electro-magnet. Recovery.*

Feb. 4, 1885.—A. K., æt. thirty-six, of New York, was planing steel, when a splinter flew off and struck his left eye. Little pain followed, but sight was lost. Feb. 5th. *St. pr.* Moderate circumcorneal injection, small pupil, synechiæ. A wound in the inner part of cornea and iris. Lens opaque. S = $\frac{1}{\infty}$. F complete. Some tenderness on pressure over ciliary region.

At 4 P.M. the same day, eye cocainized. Linear incision with a Beer's knife between int. and ext. recti. An electro-magnet brought, on the third introduction, the foreign body into the wound, where it was seized and extracted with some difficulty. It measured 4.5 *mm.* by 1.5 *mm.*, and was crescentic in shape. Conjunctival suture of wound.

Feb. 6th.—Had no pain during the night. No discharge. Slight swelling in region of wound. Suture has given way.

Feb. 8th.—Pupil dilated, adhesion only at point of entrance of foreign body. V = $\frac{1}{200}$.

The recovery was comparativety slow, pupil contracted, and

there was pain every night for a week, then the iritic symptoms subsided, the eye became white and free from pain, the cataract progressed, yet on the day of his discharge from the hospital, eleven days after the operation, he could still count fingers at the distance of 1′. Patient has presented himself at the dispensary from time to time, last on 10th July, when he had a foreign body on his cornea. The operated eye had normal size, aspect, and tension, and was free from irritation.

Though none of these cases, thus far, has given any trouble, yet even when the foreign body is removed the disease may progress; suppuration or, what is worse, chronic irido-cyclitis may develop and threaten the other eye. I therefore make it a rule, before I undertake to remove a foreign body from the interior of the eye, to obtain discretionary power from the patient to remove the eyeball whenever I find it advisable. I resort to enucleation without much hesitation when the wound is in the ciliary region and the extraction of the foreign body offers even moderate difficulty, requiring several introductions of the tip of the magnet and some probing of the interior, in order to find and get hold of the foreign body. The following cases will illustrate this principle.

CASE 7.—*Piece of steel in eye. Extraction with magnet failed. Enucleation.*

Mr. C. N., æt. 47, of Brooklyn; while at work in a machine-shop, Nov., 1883, a chip of steel struck the eye, penetrating the cornea and iris near the upper end of the vertical meridian. Cyclitis rapidly developed. An attempt was made to extract the foreign body with the electro-magnet, but failed, whereupon the eye was at once enucleated. No reaction whatever followed the operation.

CASE 8.—*Unsuccessful attempt to remove a piece of steel from the vitreous. Immediate enucleation.*

The patient was a man, B. v. d. M., æt. 39, of Jersey City. The piece of steel was found upon the ciliary body of the enucleated eye. It was $3'''$–$4'''$ square, and $\frac{1}{2}'''$ thick.

CASE 9.—*Piece of steel in vitreous. Unsuccessful attempt to remove it with magnet. Enucleation.*

G. P., æt. 15, New York. Wound in lower part of ciliary region and margin of cornea. Vitreous cloudy. Marked inflammation. Opening made 4 or 5 *mm.* behind wound, where vitreous appeared most opaque. Electro-magnet introduced, but failed to bring the chip out. Enucleation at once. Eye opened by equatorial section. Foreign body lay in lower part of vitreous just behind pars plana corporis ciliaris.

From most of these cases, as well as from the majority of those reported in literature, we come to the conclusion that foreign bodies in the vitreous are located by preference in the lower part. It seems legitimate, even when the foreign body can neither be seen, nor by an exudation or a limitation in the field of vision be localized with some degree of probability, to open the capsule of the eye in the outer-lower quadrant, introduce the point of a magnet, which should not be too long nor too thin, directly to the bottom of the vitreous, then withdraw. In case the foreign body is not reached, a second or third attempt, cautiously probing a larger area of the interior of the eye, can be made with sufficient safety; but when the foreign body then is not brought out, it is more advisable to enucleate the eye than to make further attempts, because rude dealing with the interior of the eye, even if the foreign body is at last removed, frequently enough causes cyclitis, which is dangerous for both eyes.

A CASE OF EVISCERATION OF THE EYEBALL FOLLOWED BY ORBITAL CELLULITIS (THROMBOSIS). RECOVERY. REMARKS.

By H. KNAPP.

THE substitution of exenteration or evisceration of the globe for enucleation, since its warm recommendation by Alfred Graefe, in the fall of 1883, having become one of the mooted questions of the present day, I beg to contribute the following short communication to its discussion.

For a number of years I have, every now and then, resorted to a more or less complete evacuation of the contents of suppurating or hopelessly injured eyes, until in March, 1883, an evisceration was followed by so severe a reaction that I have not practised it any more. I spoke of the case in the discussion of my paper on *blindness from retinal thrombosis in consequence of facial erysipelas*, at the Am. Ophthalmol. Soc., July 18, 1883, and my remarks are published in the Transactions of the Society, vol. iii., p. 578. As it is particularly important to watch those features or consequences of a new operation that seem to indicate danger, I think the history of such a case ought to have a wider circulation than the easily overlooked note in the Transactions of the Am. Ophthal. Society seems to warrant. The history is as follows:

An actor, St. V., of London, England, came to me at the end of February, 1883, with a staphyloma of the cornea after a recent blennorrhoic ophthalmia. The protrusion disfiguring him so much that he would have had to give up his profession, he wanted

to be operated on. I performed evisceration of the globe in order to give him a better support for an artificial eye than is obtained by enucleation, the cosmetic effect of the operation, in his profession, being particularly important. On March 2d, under ether anæsthesia, I cut off with a Beer's knife and a pair of scissors the anterior segment of the globe, about a line behind the cornea, scraped the contents of the globe clean out with a broad spoon, united, when the bleeding had ceased, the wound with episcleral sutures, strewed a thin layer of iodoform powder in the conjunctival sac, and applied the ordinary bandage of absorbent cotton and a flannel roller. The operation was smooth; the inner surface of the sclera completely freed from the intra-ocular tissues. Soon afterward the eyeball moderately filled with blood. No pain, no vomiting or other discomfort. Patient passed the night quietly. The next morning his upper lid was swollen, the eyeball tightly filled, some dark blood oozing out between the sutures. Toward evening and during the next night there was great swelling of upper lid and conjunctiva, globe moderately pushed forward, and a thin sanguinolent discharge. Great pain in eye and head. Pulse, 70; temperature not markedly increased. The whole had exactly the appearance of panophthalmitis, or rather orbital cellulitis, as there was no suppuration. During the next three days the lids were more swollen, hard, and stiff; the globe was more prominent, immovable, yet neither large nor hard or painful. The chemosed conjunctiva prevented the closure of the palpebral fissure. The orbital tissue was swollen, rigid, and painful to the touch. There was no suppuration, the discharge being sero-mucous and not abundant. In no place of the orbit was there a sign of softening or fluctuation. The patient for these three days complained of a constant dull headache, had lost his appetite, and was drowsy and apathetic. On the fifth day the sutures were cut; the wound did not discharge; it was united. The eye was poulticed for two hours. On the sixth day the patient felt somewhat better. Under continued poulticing for two hours daily the swelling very slowly diminished, also the general symptoms abated only little, until the thirteenth day, when a decided improvement began. From that day his recovery was rapid; the swelling of lids, conjunctiva, and orbital tissue subsided steadily; the headache and stupor had disappeared, the eyeball receded and became movable; and the patient was discharged from the hospital on the nineteenth day. Two weeks later the painless stump carried and moved an artificial eye admirably.

No doubt the final result in this case was excellent, yet it had not been attained without danger to life. Never have I seen such orbital cellulitis, such ominous cerebral symptoms, from any of the numerous enucleations that I have performed in the course of twenty-five years. The picture of the disease was that of *orbital cellulitis from thrombosis*, as we see it, for instance, in the course of facial erysipelas. It terminated in resolution before suppuration had set in; may be that there were, as is not uncommon in such cases, minute abscesses scattered through the cellular tissue of the orbit that did not come to view.

As to the causation of the thrombosis, I venture to give the following explanation. The vortex veins, passing obliquely through the sclerotic, a dense, fibrous tissue of very limited elasticity, will, when divided, not contract as veins in soft tissues, but remain gaping, holding a considerable column of blood, which with its thicker end dips into the liquid contents of the eviscerated globe—in our case, the blood from secondary hemorrhage. The vortex veins in their course through the sclera are, therefore, in a similar condition as the veins of bones, which, according to the researches of Virchow, as all know, are by their patency in a particularly favorable condition for thrombosis and its consequences. Suppose the liquid with which the open vein communicates, is infected, by some cause or other, then the orbital cellulitis will speedily assume a malignant character.

Bearing these conditions and the unusually severe reaction in the above case in mind, I cannot consider evisceration to be a harmless operation until extensive statistics have converted me to the contrary opinion. Alfred Graefe and the host that have copied him say that evisceration is less dangerous than enucleation, because it does "not wound the ways of communication between orbit and cranium, especially the lymph-sheath of the optic nerve, through which the traumatic inflammation is propagated." Every explanation, as well as every operation, has to stand the test of time, and the future has to show whether evisceration is devoid of danger. All oculists that have prac-

tised evisceration to some extent state that, in general, the reaction is more severe and the time of recovery longer than after enucleation. Where there is moderate reaction in many cases, and great reaction in some, as in the one above reported, I think we should be on our guard, lest in some case or other the operation prove fatal. Thus far no lethal issue of evisceration of the globe has come to my knowledge, yet our experience with this operation is still limited, and a word of caution, if there is good reason for it, should never be suppressed. I sincerely hope that evisceration may prove safer than enucleation, or at least as safe, for the mutilation from enucleation is a source of life-long misfortune to many a sufferer in all classes of society.

SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY DURING THE SECOND AND THIRD QUARTERS OF THE YEAR 1884.

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WITH THE CO-OPERATION OF

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Translated by Dr. F. E. D'Oench, New York.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

By H. MAGNUS, M.D.

a.—TEXT-BOOKS, MONOGRAPHS, TREATISES ON GENERAL, BIBLIOGRAPHICAL, AND HISTORICAL SUBJECTS.

213. Mauthner. Historical remark in regard to the red reflex of the fundus. *Centrabl. f. pract. Augenhk.*, Sept., 1884.

214. Michel. Text-book of ophthalmology. With eighty-five wood-cuts and two colored plates. 674 pp. Wiesbaden, 1884. The author has prepared the book with special regard both for the physician and student. The anatomy of the eye, both normal and pathological, is presented in an excellent manner, as might be presupposed in view of the author's well-known skill in anatomical investigations. The description of diseases is also highly satisfactory. Special attention has been paid to the connection of diseases of the eye with constitutional diseases.

Mauthner (213) quotes from Priestley's history of optics, showing that Mariotte had already experimentally shown that the

redness of the pupil was due to the reflection of light from the fundus.

215. REICH. A few words on the blind in general, and in the Caucasus. Tiflis, 1884.

According to REICH (215) there are in Russia the following institutes for the blind: In St. Petersburg, two of the St. Petersburg Philanthropic Society; also St. Mary's Institute for blind girls, with an asylum (1871); a school for twelve blind boys (1881); a school for blind girls, founded 1883. In Warsaw, a school for the blind and the deaf and dumb (1817). In Riga, a school for the blind. A school for eighteen boys projected at Rewal. Asylums for the blind: Two at Moscow, two at St. Petersburg, one at Kiew. A school for the blind in course of erection at Charkow. HIRSCHMANN.

b.—STATISTICAL PAPERS.

216. BROCKMANN, DRAKE. A statistical review of 1,767 cases of cataract-extraction. *Opth. Rev.*, vol. iii., No. 34.

217. DOR. 7e rapport annuel de la clinique ophthalmologique. Lyon, 1884.

218. JUST. 11th report on the Ophthalmic Institute at Zittau for 1882 and 1883. Zittau, 1884.

219. INOUYE. Private ophthalmic clinic at Tokio, Japan. Report for 1883. Tokio, 1884.

220. MAIER. Ninth annual report of the ophthalmic department of the association clinic. Karlsruhe, 1884.

221. SCHIESS-GEMUSEUS. Basel Ophthalmic Institute. 20th annual report, from Jan. 1, 1883, to Jan. 1, 1884. Basel, 1884.

222. SCHÖLER and UHTHOFF. Contributions to the pathology of the optic nerve and retina in constitutional diseases, with statistics of operations during 1882 and 1883 appended. Berlin, 1884.

223. SEGGEL. Report on the ophthalmic department of the military hospital at Munich. Berlin, 1884.

224. WICHERKIEWICZ. 6th annual report on the ophthalmic hospital for the poor at Posen for 1883. Posen, 1884.

DOR (217) treated 1,375 new patients in 1883; 23 extractions, with 20 good and 2 moderate results; 1 failure. In one case a cysticercus was removed from the vitreous. A paper on a new method of operating for trichiasis and entropium is added; also

a description of the extraction of a cysticereus from the vitreous, and a paper on hemeralopia.

In five cases the cataract was ripened according to Förster's method; in four with good, in one with moderate, result.

JUST (218) treated 6,158 patients. 145 extractions of uncomplicated senile cataracts: 136 good, 4 moderate, results; 5 failures.

INOUYE (219) treated 2,623 patients at Tokio. 13 extractions, 12 of them according to Graefe; 82 iridectomies, 35 operations on the lids, 13 on the conjunctiva, 7 on the muscles, 7 enucleations, 3 sclerotomies, 1 optico-ciliary neurotomy, 4 amputations of the eyeball.

MAIER (220) treated 2,398 eye-patients in 1882, 2,433 in 1883. The largest number of patients was treated in March and April; the smallest, in August and September. Uncomplicated cataracts operated, 85: 77 good, 4 moderate, results; 4 failures—*i. e.*, 4.7 %. Number of more important operations performed, 422.

SCHIESS (221) treated 1,668 new patients at the policlinic, in 1883, and performed 205 operations. Forty-seven extractions of senile cataract: 42 good, 2 moderate, results; 3 failures.

SEGGEL (223) treated 830 soldiers for affections of the eye. Diseases of the conjunctiva were the most numerous, followed by those of the cornea and lids. Trachoma is very rare among the garrison of Munich. Ten cases of gonorrhoic ophthalmia were treated; two eyes were lost. The cause of infection could generally be attributed to some unimportant affection of the eyes, like blepharitis, etc., which induced frequent scratching and rubbing, making infection easier. In 85 % of all cases of iritis, syphilis was the cause. Syphilitic iritis, however, forms only 1 % of all specific diseases.

SCHÖLER (222) performed 731 operations in 1882 and 1883. Among 100 extractions, 3 failures; 26 % obtained V = $\frac{1}{3}$–$\frac{1}{2}$; 16 % V = $\frac{1}{2}$–$\frac{2}{3}$; 17 % V = $\frac{2}{3}$–1. 26 % obtained V = $\frac{16}{10}$–$\frac{16}{200}$. Good V was not expected in 13 patients. Notwithstanding the most stringent antiseptic precautions were observed, septic infection occurred in 2 cases.

WICHERKIEWICZ (224) treated 3,149 patients, and performed 345 operations. Extractions, according to Graefe, 30, with 25 good and 4 moderate results, and 1 failure. Five extractions within the capsule, with 3 good and 2 moderate results. Uletomy, as recommended by Panas—*i. e.*, the division of the sclero-corneal cicatrix in iridectomy for glaucoma, was performed in one case.

Wicherkiewicz recommends instead of this gentle massage of the eyeball during the first days after the iridectomy, in order to prevent too rapid and energetic cicatrization of the wound. Jequirity is not recommended. He praises the galvano-caustic treatment of corneal ulcers and infiltrations.

II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPEUTICS.

a.—GENERAL PATHOLOGY AND DIAGNOSIS.

225. BAER. Measurement of the visual field and its general diagnostic importance. *Volkmann's Sammlung klinischer Vorträge*, 1884, No. 246.

226. FALCHI. New-formation of the epithelium of the anterior capsule of the lens of fully grown animals in health and in disease. *Arch. f. Ophth.*, vol. xxx., 1.

227. DA GAMA PINTO. On karyokinesis in the inflamed human conjunctiva. *Centralbl. f. pract. Augenhk.*, April, May, 1884.

228. HEYNE. Changes in the tissue of the iris in various eye-diseases. *Inaug.-Diss.*, Königsberg, 1884.

229. TARTUFERI. On karyokinesis of the epithelium of the conjunctiva. *Centralbl. f. pract. Augenhk.*, Aug., 1884.

BAER (225) presents the diagnostic importance of measuring the field of vision in a very instructive manner, and adds a few drawings.

According to FALCHI (226) the new-formation of the epithelial elements of the anterior capsule of the lens takes place in the rat, the hog, the chicken, and the frog by indirect division. This process is more common in amphibia than in mammals and birds. When the anterior capsule is injured, this process of repair is most energetic near the wound, diminishes as the distance from the wound increases, and finally ceases entirely.

PINTO (227) thinks that the proliferation of the inflamed conjunctival epithelium is produced by indirect division of the nuclei. The increased proliferation of the cells is probably the cause of the so-called papillary swelling.

HEYNE (228) has studied the changes in the tissue of the iris, both experimentally and in enucleated diseased eyes, and has obtained the following results.

After the injection of irritating chemical substances into the anterior chamber:

1. Fibrino-purulent exudation into the anterior and posterior

chamber. 2. The exudation lies free upon the surface of the iris; the anterior endothelium and posterior epithelium remain in position. 3. Marked hyperæmia and symptoms of beginning migration in the blood-vessels. 4. Small hemorrhages into the iris. 5. Accumulations of pus corpuscles in the tissue of the iris. 6. Swelling of the cells of the tissue to epithelioid bodies.

In various diseases of the eye the tissue of the iris had undergone the following changes:

In senile cataract:

1. Hypertrophy of the fibrillous tissue in the vascular layer. 2. Beginning of hyaline degeneration in the media of the arteries.

In soft cataract:

Increase of lymph-corpuscles throughout the tissue of the iris.

In synechiæ of the iris:

1. Fibrous degeneration of the tissue of the iris with subsequent compression and obliteration of the arteries; adhesion of the intima; beginning hyaline degeneration. 2. Formation of pigment in the calibre of the blood-vessels. 3. Accumulation of fat in the tissue. 4. Small hemorrhages.

In acute glaucoma:

1. Increase of the lymph-corpuscles in the whole stroma of the iris. 2. Large fissures between the bundles of connective tissue in the vascular layer of the iris (œdema or lymph-stasis). 3. Decrease of the calibre of the arteries.

In chronic glaucoma:

Apparently increased vascularity, due to rarefaction of the iris-tissue. 2. Hyaline or gritty degeneration of the walls of the blood-vessels; the calibre obliterated by endothelial agglutination, often filled up with pigment.

TARTUFERI (229) has experimentally investigated the karyokinetic process, and has obtained the following results: 1. Slight irritation increases it, even after the lapse of only three hours and a half. 2. The greatest increase takes place in the immediate neighborhood of the point of irritation. 3. The most marked increase is produced by bruising. 4. Slight continuous irritation does not exaggerate the effect, while the area over which the process spreads is limited. 5. The intensity of the process diminishes as the distance from the point of irritation increases.

b.—GENERAL THERAPEUTICS.

230. C. ENGELSKJÖN (Christiania). De elektriske stromarters ulige artede terapeutiske virkemaade og den elektro-dynamiske

synsfeltpröve. *Nord. med. Arkiv*, vol. xvi., No. 1, Stockholm, 1884.

231. GRAEFE. Enucleation or exenteration of the globe. Versamml. deutscher Naturforscher u. Aerzte zu Magdeburg, 1884, Tageblatt.

232. JACOBSON. Preparatory iridectomy and antiseptic treatment. *Arch. f. Ophth.*, vol. xxx., 2.

233. NAMIAS. L'antisepsi nella chirurgia oculare. *Riv. clin.*, No. 3, 1884.

According to ENGELSKJÖN (230) the galvanic and faradic currents produce opposite effects, the latter dilating the actively contracted arteries, and the former contracting them when actively dilated. In the fourth chapter he discusses what he calls the electro-diagnostic test of the field of vision. A series of experiments on nervous patients showed that the one kind of current increased the extent of the field of vision, the other diminished it, and that in the case in question the former only was the right one. SCHJÖTZ.

GRAEFE (231) calls attention to the fact that meningitis with fatal result has repeatedly been observed after enucleation of the globe. The meningitis is due to propagation of septic irritation from the wound, and remains limited within the orbit to one or the other communication with the cerebral cavity. Antiseptic treatment has thus far not been able to prevent such accidents with certainty. Graefe therefore proposes to substitute exenteration for enucleation of the globe. This operation, first practised methodically and developed by Graefe, is performed as follows: The conjunctiva is detached about 1–2 *mm.* from the corneal margin, and the cornea is then abscised with the scleral ring. The contents of the globe can then be easily removed with a broad, blunt spoon, leaving nothing but the empty scleral shell. The contents of the globe can be removed enclosed within the uveal tract, so that they can be examined microscopically. After exenteration iodoform is dusted into the shell remaining behind, and the conjunctiva united with a few catgut sutures. The essential difference between enucleation and exenteration consists in this, that in the latter the communications between the orbital and cranial cavities are not injured, thus preventing the propagation of any inflammation along the path. Of course exenteration cannot be practised in tumors of the globe.

According to JACOBSON (232) preparatory iridectomy hastens

the ripening of cataract, makes the extraction easier, and diminishes the danger, inasmuch as the most serious step in the operation is performed first, produces a cleaner, less gaping wound, and prevents inflammation which might be caused by remnants of iris and coagulated blood.

The instruments should be carefully cleansed in absolute alcohol and carbolic acid, disinfecting liquids substituted for water, and prepared cotton for lint and sponges,—measures which in connection with the well-known surgical precautions will prevent an infection of the wound as far as this is possible in view of the peculiar position of the eye. The iodoform dusted in after the operation unites the edges of the wound, prevents the entrance of foreign bodies, and hinders the escape of the aqueous.

According to NAMIAS (233), Manfredi in Modena performs all operations under the strictest antiseptic precautions; he uses 1–2-per-cent. solutions of carbolic acid only for the spray, the cleansing of the eyes and instruments, and for the bandage. There was one loss from septic infection among his last 132 operations, 55 of which were extractions and 62 iridectomies, and that one loss was an extraction. In this way he succeeded in reducing his losses in extractions from 10.43 per cent. in the pre-antiseptic period to 1.81 per cent. in the last series. He never observed any irritation from the use of carbolic acid, a fact which he ascribes to the manner in which the solutions are prepared. The carbolic acid is heated until it liquefies, a little alcohol is added and this mixture poured into almost boiling distilled water. After thoroughly shaking it and letting it cool off, the solution is filtered and stored away in carefully sealed bottles. This, according to the author, is the secret of preparing 1–2-per-cent. solutions of carbolic acid which do not irritate the eye.

DANTONE.

III.—INSTRUMENTS AND REMEDIES.

a.—INSTRUMENTS AND TECHNICAL CONTRIVANCES.

234. BIRNBACHER. An incandescent lamp for ophthalmoscopic purposes, the patient to lie on his back. *Centralbl. f. pract. Augenhk.*, June.

235. CHARPENTIER. Nouveau modèle d' instrument destiné à l' examen clinique de la sensibilité lumineuse et de la perception des couleurs. *Arch. d' ophth.*, vol. iv., No. 3.

236. CHARPENTIER. Note additionnelle relative à une modification de mon photomètre differentiel. *Arch. d' ophth.*, vol. iv., No. 3.

237. COUPER. A magazine-ophthalmoscope. *Trans. Ophth. Soc.*, vol. iii. Refraction-ophthalmoscope with 72 lenses, which can be brought successively behind the mirror. FITZGERALD.

238. FAUCHER. Blepharostat. *Gaz. des hôp.*, June 21, 1884, No. 72.

239. GAZÉPY. Campimètre portatif. *Rec. d' ophth.*, Aug., 1884.

240. MAKLAKOFF. Un procédé de fixation du globe oculaire pendant les opérations. *Arch. d'ophth.*, vol. iv., No. 5, Sept. and Oct., 1884.

241. SMITH, PRIESTLEY. Simple ophthalmoscope for shadow test. *Ophth. Rev.*, Sept., 1884.

242. SMITH, PRIESTLEY. Ophthalmoscopic lamp. *Ophth. Rev.*, Sept., 1884. Portable lamp in shape of a tube with lenses.

243. ZEHENDER. An apparatus with four mirrors for determining the angle of convergence of the visual lines. *Klin. Monatsbl. f. Augenheilk.*, 1884, vol. xxii., p. 231.

CHARPENTIER'S (235) photometer is intended for clinical purposes, for which it seems well adapted, judging from the description and illustration. Before using it the observer must test himself, his own sensibility being made the standard of comparison; the power of the eye to adapt itself to different intensities of light must, of course, be taken into consideration. For a fuller description *v.* the original. v. MITTELSTÄDT.

In connection with his experiments CHARPENTIER (236) describes an improvement of his differential photometer, whereby he succeeded in illuminating only the background and in excluding light entirely from the black dots (holes in white paper).
v. MITTELSTÄDT.

FAUCHER'S (238) speculum is intended to prevent pressure upon the eye when the lids are pressed together; it has a branch above and one below, which can be fixed with a screw in positions varying according to the prominence of the eye, and which rest on the supra- and infra-orbital margins. The speculum is inserted in the usual manner after fixing the branches. v. MITTELSTÄDT.

GAZÉPY (239) has constructed a portable campimeter. It con-

sists mainly of a rule, at one end of which is the object of fixation and in whose sheath there is a disc for the colored objects.

MAKLAKOFF (240) inserts a horn-plate into the conjunctival sac after introducing the speculum; it applies closely to the globe, and fixes or moves the globe by stretching the conjunctival sac, thus preventing the edges of the wound from gaping. He tried the method in an extraction upward, where the patient was unable to roll the eye downward. V. MITTELSTÄDT.

b.—REMEDIES.

244. SCHUCHARDT. Contribution to the history of the use of the schischm (chichm) seeds in eye-diseases, analogous to that of the jequirity-seed. *Correspondenzblätter d. allg. ärztl. Ver. v. Thüringen.*

SCHUCHARDT (244) calls attention to the schischm-seeds, a popular remedy for eye-diseases, which were introduced into Europe from Egypt after Napoleon's campaign in that country. The opinions of oculists of that time differed widely as to its efficacy in trachoma. Some claimed to have obtained excellent results in the army of the Netherlands, while Rust condemned them. The remedy was soon entirely forgotten. It would be interesting to give it another thorough trial.

IV.—ANATOMY.

a.—RETINA AND CHOROID.

245. SCHIEFFERDECKER. Contribution to the knowledge of the supporting tissue of the retina. *Nachrichten v. d. Königl. Gesellsch. d. Wissensch. u. d. Georg-August Univ. zu Göttingen*, 1884, No. 7.

SCHIEFFERDECKER (245) describes two principal systems of larger cells in the supporting tissue of the retina: one which extends through the thickness of the retina, the radial fulcrum-cells; the other parallel to the surface, the tangential fulcrum-cells. The protoplasmic, nuclear portion of both lies in the inner granular layer. The radial fulcrum-cells extend in all animals from the inner to the outer limiting membrane, are more or less fibrous, subdivide into fibrils, and finally interlace to form the outer limiting membrane. The tangential fulcrum-cells can be subdivided into two classes, those which contain nuclei and those which do not; they seem to occur in all vertebrates. The inner granular layer contains the following elements: the nerve-

granules and their fibres; the spongioblasts; the nuclear tangential fulcrum-cells, at least the cell-body and nucleus; the tangential cells without a nucleus; and the nucleus and protoplasmic portion of the cell-body of the radial fulcrum-cells. The outer granular layer contains: the fibres of the inner nerve-granules and their ramifications, which here unite with the fibres of the rods and cones; the terminations of the tangential fulcrum-cells; the outer, generally ramified ends of the radial fulcrum-cells, which pass through perpendicularly or obliquely; and the small granules of the granular layer.

b.—OPTIC NERVE AND BRAIN.

246. GRÜNHAGEN and COHN. The origin of the fibres dilating the pupil. *Centralbl. f. pract. Augenhk.*, June.

247. ULRICH. Refraction and optic disc of the new-born. *Inaug.-Diss.*, Königsberg, 1884.

According to GRÜNHAGEN (246) the sympathetic fibres of the iris which dilate the pupil originate in the brain; there is, therefore, a cilio-cerebral and not a cilio-spinal centre, as some have maintained.

According to ULRICH (247) the papilla of the new-born is remarkable for its gray color, the accumulation of pigment in its neighborhood, and its poverty in small blood-vessels. Otherwise it does not differ from the papilla of adults.

V.—PHYSIOLOGY.

a.—GENERAL PHYSIOLOGY.

248. CHARPENTIER. Nouvelles recherches analytiques sur les fonctions visuelles. *Arch. d'ophth.*, vol. iv., 4.

249. MATTHIESEN. The focal lines of an infinitely thin astigmatic pencil of light after oblique incidence of a homocentric pencil upon a curved surface, and the conoid of rays of Sturm and Kummer. *Arch. f. Ophth.*, vol. xxx., 2.

250. PARINAUD. Sur la sensibilité visuelle. *Comp. rend. des séances de l'acad.*, No. 6.

251. WULFFBERG. On testing the central and peripheric sensibility to light. *Sitzungsber. d. phys.-med. Soc. zu Erlangen*, May 12, 1884.

CHARPENTIER (248) investigated the relation between light- and color-perception, by presenting in succession several red, green,

and blue points of light to the eye, and then determining with a photometer the smallest quantity of light which produced for the various colors first perception of light and then of color. Both tests showed that the smallest quantity of light was necessary for red, and then increased for green and blue, though the amount necessary to produce the sensation of color increased much more rapidly than that necessary to produce the sensation of light. The elements for perceiving light and color, therefore, are not equally sensitive. A similar relation exists when sight is tested.

WULFFBERG (251) describes the essential features of a method for determining rapidly and accurately central and peripheric perception of light, and expressing its anomalies numerically.

b.—RETINA AND BRAIN.

252. EPPLER. The venous pulse of the retina. *Mittheilungen a. d. ophthalm. Klinik in Tübingen*, vol. ii., No, 1. Tübingen, 1884.

253. EWETZKY. An anomaly of the retinal venous pulse hitherto not described. *Wjestnik Ophth.*, May, June, 1884. *Centrabl. f. pract. Augenhk.*, June, 1884.

254. LOEB. The visual disturbances after injury to the gray substance of the brain. From experiments on the dog. *Arch. f. d. ges. Physiol.*, vol. xxxiv., Nos. 1, 2, 3, and 4.

255. MUNK. The central organs of sight and hearing in vertebrates. *Berliner acad. Sitzungsber.*, vol. xxxiv., 1884.

EPPLER (252) recognizes two types of venous pulse: (1) Pulsatory contraction, which is confined to a greater or less extent of the vein; and (2) pulsatory dilatation, the vein becoming broader and darker, while the bright central streak disappears at the dark, wider portion. The dilated part may be the last visible portion of the vein, but may also be adjacent to the latter, so that the terminal portion itself becomes rhythmically paler. Sometimes the dilated part moves rhythmically, rapidly towards the periphery, slowly in a centripetal direction, while the terminal part becomes paler. Both types can occur in the same vein.

EWETZKY (253) observed venous pulsation far beyond the boundaries of the papilla, and well marked in two young ladies, seventeen and eighteen years old. A few weeks later it was visible in only one and much restricted.

LOEB (254) comes to the following conclusions: 1. Every portion of the cortex of the posterior lobe, the medial and lateral

part of Munk's visual sphere, the visual centres of Dalton, Ferrier, Luciani, and Tamburini, can be removed without affecting sight in the slightest degree. These authors are, therefore, mistaken when they assert that the removal of this portion must necessarily be followed by visual disturbances, and especially, that centres of vision are located here. 2. When a visual disturbance occurs in an animal operated upon for the first time after extirpating a portion of the occipital lobe, this disturbance always takes the form of homonymous lateral hemiamblyopia, on the side opposite the injured hemisphere, no matter what portion had been removed. 3. In all cases of unilateral as well as bilateral hemiamblyopia, the animals fix and see best with the macula lutea; the latter, possibly, not being injured, or, at any rate, less than the remaining portions.

The cause of the hemiamblyopia after removal of the so-called visual sphere must be sought in the processes leading to the conception of sight. The whole difference in visual power between the two portions of the field of vision consists in this, that the reaction on all irritation is increased in the neglected part of the visual field. The hemiamblyopia does not depend alone upon the loss of a portion of cortex, but to a very great extent upon the irritation connected with the extirpation and process of healing.

MUNK (255) finds that rabbits whose cerebral hemispheres are removed lose their sight completely. Rabbits live for about fifty hours after the removal, rats and guinea-pigs about ninety. Three stages may be distinguished after the operation. The first, which immediately follows the operation, may be designated as the stage of exhaustion, and lasts about half an hour to an hour. Then follows the stage of rest, which lasts several hours. The third stage is that of unrest, during which the animal runs about more and more. The stage of rest is best suited for testing vision. The pupils react, but otherwise there are no indications that the animals can distinguish between light and darkness.

c.—IRIS AND MUSCLES.

256. LUCHSINGER. The innervation of the iris of the rabbit. *Arch. f. d. ges. Phys.*, vol. xxiv., 5 and 6.

257. QUAGLINO. Riassunto delle attuali nostre cognizioni sui movimenti della pupilla nello stato fisiologico e morboso. *Ann. di ottalm.*, vol. xiii.

258. REYMOND. Modificazione all' esame degli equilibrii muscolari e leggi del rapponto tra l'A. et la convergenza ocularie. *Ann. d'ottalm.*, vol. xiii.

259. SHEGLINSKY. The movements of the pupil. *Dissert.*, Kasan, 1884.

LUCHSINGER (256) has found that when one eye of a rabbit is illuminated while the other is shaded, the sphincter of the iris is much more contracted in the former than in the latter.

SHEGLINSKY'S (259) dissertation was written under Prof. DOGIEL'S supervision. The first two parts contain an historical and a literary review of the anatomy of the muscular apparatus of the iris, and its innervation in mammals and birds. Part third contains the author's own investigations on birds, from which he draws the following conclusions: 1. The nerve-fibres contracting the pupil are contained in birds also in the oculomotor nerve. 2. The cervical part of the sympathetic nerve does not contain any fibres affecting the movements of the pupil. 3. The ophthalmic branch of the fifth nerve contains all the fibres which dilate the pupil; irritation of its centrifugal fibres (best mechanically within the orbit) always produces dilatation of the pupil; irritation of the centripetal fibres of the trigeminus (after division) produces contraction of the pupil, a reflex upon the oculomotor nerve. Irritation of both kinds of fibres produces contraction, on account of the mechanical preponderance of the sphincter over the dilator. The author also describes several experiments as to the action of atropine, eserine, curare, and nicotine, and declares himself in favor of the theory generally accepted, that the movements of the pupil are produced by two independent antagonistic muscles. According to a report in *Wjestnik Ophth.*, May and June, 1884. HIRSCHMANN.

d.—COLOR-PERCEPTION.

260. DOBROWOLSKY. On the difference in color-perception when one or several parts of the retina are irritated. *Wjestnik Ophthalm.*, May and June, 1884.

261. DONDERS. Once more the theories of color-perception. *Arch. f. Ophth.*, vol. xxx., 1.

262. KÖNIG. Contribution to the knowledge of dichromatic color-systems. *Arch. f. Ophth.*, vol. xxx., 2. There is no sharp boundary line between red-blind and green-blind, rather the contrary.

263. POSADA-ARMIGO. Dyschromatopsie traumatique. *Rec. d'ophth.*, Aug., 1884.

264. S. M. BURNETT. Theories of color-perception. *Amer. Journ. of Med. Sci.*, July, 1884.

265. VON SZILÁGYÈ. The determination of the intensity of action of the pigment-colors. *Centralbl. f. d. med. Wissensch.*, 1884, No. 17.

According to E. FICK's (260) investigations (*Pflüger's Arch. f. d. ges. Physiol.*, vol. xvii., p. 152), a bit of partly illuminated colored paper, placed behind a screen in which there is an opening 0.6 *mm.* in diameter, is scarcely recognized in its true color at a distance of 6½ metres, while through 16 openings, though smaller (0.47 *mm.*), 20 *mm.* apart and arranged in a square, the color of the paper behind them could be easily recognized at the stated distance. In the former case the visual angle amounted to 19 sec., in the latter for each opening to 15 sec. From this experiment Fick concludes that the impressions of the 16 openings, though entirely separate, nevertheless seem to be added in producing the sensation of color.

DOBROWOLSKY (260) has lately taken up these experiments again and arrived at the following results: 1. When the openings were 20 *mm.* apart, he could not find so great a difference as Fick, either for colored paper or glasses. 2. In all the experiments the openings were not clearly defined at 3–4 metres distance, though each could be distinctly recognized, but appeared like colored stars, on account of the dispersion-circles. Dobrowolsky here remarks that the refraction of his eyes is normal, and that glasses do not exert any marked influence. 3. The smaller the distance between the openings, the greater the distance at which they still appeared colored to the eye. When only 5 *mm.* apart, the openings seemed to coalesce, *i. e.*, the dispersion-circles touched each other. 4. The same result was reached with 16 squares (½ *cm.*) of red paper pasted on pasteboard. The smaller the distance apart, the sooner the dispersion-circles can touch, and the greater the distance therefore at which they will be recognized as colored. Dobrowolsky does not deny the possibility that separate points of colored light may aid each other in producing the sensation of color, as Fick assumes, but gives a different explanation. As every oculist knows, binocular exceeds monocular vision, sometimes by as much as ¼. This could be demonstrated both in himself and in others who were present at the experiments. From

this Dobrowolsky concludes that in binocular vision the different impressions are combined into one in the brain, and thus add to one another. The same can very probably be assumed for an eye whose retina is irritated at different points.

DONDERS (261) seeks to disprove the objections raised by Hering against his explanations. Color-blindness is an important argument in support of the phylogenetic origin of the sense of color. Our normal color-system developed from a dichromatic system, and first in woman.

POSADA-ARMIGO (263) reports an interesting case of traumatic color-blindness: A colonel was struck by a musket-ball in the left temple. For several days the patient was unconscious and delirious. When consciousness returned it was discovered that he had entirely lost his memory, so that he had to be taught the names of the commonest objects; he was very deaf, and the sense of taste and smell were lost; instead of colors he only saw white and black, and could not distinguish "the relief and solid forms of objects." Two months after the injury splinters of bone still came from the wound. Hearing returned on the left (injured) side, but remained very poor on the right; smell and taste also gradually returned. Soon he could again distinguish "the solid form of bodies," but the dyschromatopsia continued for two years, when he could again distinguish all colors; he recognized red first, and green last. MARCKWORT.

VI.—ANOMALIES OF REFRACTION AND ACCOMMODATION.

BY DR. HORSTMANN.

266. ULRICH, G. Refraction and papilla optica of the eyes of the new-born. *Inaug.-Dissert.*, Königsberg, 1884.

267. HOFFMANN, ARTHUR. The relation of the refraction to the muscles of the eye, based on an examination of the eyes of the scholars of the Strasburg Lyceum. *Inaug.-Diss.*, Strasburg, 1883.

268. BESELIN, OTTO. Examinations on the refraction and base-line of the eyes and the dynamic conditions of the lateral muscles in girls from five to eighteen years old. *Arch. f. Augenhk.*, vol. xiv., 2, p. 132.

269. SEGGEL. On normal vision and the relation between refraction and vision. *Graefe's Arch. f. Ophthalm.*, vol. xxx., 2, p. 69.

ULRICH (266) did not find a single myopic eye among 204 eyes of new-born children, 34 with H 1.0 D, 124 with H 2.0 D, 8 with H 3.0 D, 16 with H 4.0 D, 2 with H 6.0 D, and 20 with regular Ah. He did not find any essential difference between the two eyes of the same child.

That myopia can be produced by near work is well known. It is a disputed question, however, whether the cause should be attributed to the accommodation or to the convergence. In order to cast some light on the etiology of myopia HOFFMANN (267) examined not only the refraction, but also the muscles, of the scholars of the Strasburg Lyceum. He arrived at the following results: The number of myopes was 36.67 %. The abduction of the emmetropes was equal to $8\frac{1}{4}°$ on the average. Abduction more than 13° and less than 10° rarely occurred in normal emmetropic eyes. In the emmetropes there was generally dynamic equilibrium for distant vision; dynamic divergence occurred only together with other abnormities of the eyes.

BESELIN (268) (see the translation of his paper in this number) examined the eyes of the scholars between the ages of five and eighteen, of the female seminary at Heidelberg, as to the dynamic conditions of the lateral muscles of the eye. He found their equilibrium very often disturbed in all refractive conditions, not only in adults, but also in children from five years up. The external recti overbalanced the internal recti in every state of refraction in more than $\frac{1}{3}$ of all cases, in myopia in more than half. The internal recti generally preponderate in hypermetropia, and in about $\frac{1}{3}$ of all cases.

SEGGEL (269) examined 3,120 eyes of soldiers and found in 72 % V > $\frac{8}{10}$ Snellen, in $21\frac{1}{4}$ % V between $\frac{1}{10}$ and $\frac{8}{10}$, in $4\frac{1}{2}$ % between $\frac{6}{10}$ and $\frac{1}{10}$, and in the remainder even less. 1,553 eyes were emmetropic, their V = $\frac{8}{10}$ on the average. (The remainder of the paper appears unreliable; 673 persons are entered with H = 0.25 D., 86 with M = 0.25 D., values that fall altogether within the limits of errors of observation.—H. K.).

VII.—AFFECTIONS OF THE LIDS.

270. BURCHARDT. Contributions to the anatomy of the chalazion. *Centralbl. f. pract. Augenhk.*, 1884, p. 229.

271. v. BRINKEN. Hard chancre on the inner surface of the upper lid. *Zehender's klin. Monatsbl. f. Augenhk.*, vol. xxii., p. 371.

272. ARMAIGNAC, H. Kystes graisseux des deux paupières, d'origine congénitale, en grande partie résorbés probablement spontanément. Extirpation. Guérison. *Rev. clin. d'ocul.*, 1884, No. 4, p. 84.

273. DUJARDIN. Un cas de pustule de la paupière. *Journ. des sciences méd. de Lille*, 1884, No. 11, p. 398.

274. HILBERT, R. On a peculiar form of gangrene of the lids in children. *Vierteljahrsschr. f. Dermatologie u. Syphilis*, 1884, p. 117.

275. BRUCH. Redressement des cils. Trichiasis. *Journ. de méd. et de chir. prat.*, June 1884, p. 257.

276. MARTIN, G. Blepharospasme astigmatique. *Ann. d'ocul.*, vol. xci., p. 231.

BURCHARDT (270) found in many cases of chalazion a movement of granules within the cells belonging to the parenchyma of Meibom's glands. It never occurred in cells which had already undergone fatty degeneration. The cells in which the movement took place resembled the other apparently normal cells. Burchardt thinks that these granules are the cause of the affection of Meibom's glands and lead to the development of a chalazion.

BRINKEN (271) saw an almost circular specific ulcer in a man æt. thirty-two on the inner surface of the upper lid, on the nasal half.

ARMAIGNAC (272) extirpated a congenital fatty tumor of both lids, which extended throughout their whole breadth like a fold to the edge. It formed a loose sac, penetrated the orbicularis muscle with which it was partly united, and extended far into the orbit, without, however, being firmly connected with the neighboring tissue, so that it could easily be removed. Healing by first intention. v. MITTELSTÄDT.

DUJARDIN (273) saw in a child, æt. three, a malignant pustule of the left upper lid with gangrene of $\frac{3}{4}$ of the latter, which developed within 15–16 hours. Compresses of strong solutions of carbolic acid were applied alternately with iodoform salve, whereupon the gangrenous portion was gradually cast off; eighteen days later tarsoraphy was performed, which succeeded completely.
v. MITTELSTÄDT.

HILBERT (274) reports two cases of gangrene of the lids in otherwise healthy children. The gangrenous portions were removed, the floor of the defect touched repeatedly with lunar caustic, and a bandage of carbolized cotton applied. About a week later the defect was completely healed over.

BRUCH (275) destroys the follicles with a heated lead-pencil-point in circumscript trichiasis. In other cases he performs the illaqueatio of Celsus, which does not seem to have been known to him as such. v. MITTELSTÄDT.

MARTIN (276) reports 5 cases of blepharospasm, which he ascribes to astigmatism. MARCKWORT.

VIII.—LACHRYMAL APPARATUS.

277. DEL TORO. Acute dacryocystitis produced by jequirity. *Cronica de especialidades medico-quirurgicas*, Jan., 1884.

DEL TORO (277) reports the cases of two girls of eight and nineteen respectively, who never before had suffered from any lachrymal affection, in whom acute dacryocystitis developed after the application of jequirity.

IX.—MUSCLES AND NERVES.

278. BERRY, G. A. The determination of the degree of latent and manifest squint in metre-angles. Suggestion. *Ophthalmic Rev.*, vol. iii., No. 33, p. 193.

279. REVOLET. De l'insuffisance des droits internes et de son traitement par la ténotomie partielle. *Thèse de Paris*, 1884.

280. FERGUSON, M. A. Spasmodic internal strabismus. *Med. Rec.*, June 7, 1884, p. 638.

281. BRAILEY, W. Muscular asthenopia. *Trans. Ophth. Soc. Unit. Kingd.*, 1883, vol. iii., p. 207.

282. MADDOX. Relation between convergence and accommodation. *Ibid.*, p. 280.

283. MAUTHNER, L. The etiology of the complicated paralyses of the muscles of the eye. *Wiener med. Blätter*, 1884, No. 20, p. 619.

284. HOCK. Case of paralysis of all the muscles of both eyes. *Wiener med. Blätt.*, 1884, No. 22, p. 681.

285. LAGRANGE. L'arrachement du nerf nasal externe dans les douleurs ciliaires et la nevralgie du trijumeau. *Arch. d'ophth.*, 1884, vol. iv., 4, p. 324.

REVOLAT (279) recommends partial tenotomy of the external recti, according to Abadie, in insufficieny of the internal recti. The entire attachment of the muscle is severed, except a small central portion; the detached portions of the tendon are then seized with a forceps and abscised obliquely with a pair of scissors, so as to weaken the power of the muscle. v. MITTELSTÄDT.

FERGUSON'S (280) case was one of a watchmaker who in the course of his work developed an inward squint of the left eye which was at first periodic. This eye was myopic. No account of his eye under a mydriatic is given. He is reputed to have improved under a plane glass for the right and a concave (number not given) for the left, and some general treatment. BURNETT.

BRAILEY (281) reports the case of a child aged seven years, who suffered from severe headaches after very short use of his eyes. No hypermetropia ; complete and lasting relief afforded by prisms with bases inwards. FITZGERALD.

MADDOX (282) devised an ingenious instrument for determining the relation between convergence and accommodation. FITZGERALD.

MAUTHNER (283) subdivides the paralyses of the muscles of the eye into peripheric, orbital, and intracranial, the latter again into basal and cerebral. The basal paralyses may be the result of meningitis, neoplasms, etc. The cerebral paralyses he subdivides into cortical, nuclear, and fascicular. In the nuclear the ciliary muscle and sphincter are not affected ; cerebral symptoms are absent ; they exist since birth or develop, generally in young persons, in course of a few years. Besides these cases others occur which gradually develop under the symptoms of bulbar paralysis and ataxia ; the symptoms of the former affection subside, while the paralysis of the ocular muscles remains.

HOCK (284) observed paralysis of all the muscles of the eye, except the sphincter of the iris and the ciliary muscle, in a patient aged forty, who had had necrosis of the lower jaw at the age of fourteen. Hock attributes the cause to a basilar affection, and does not consider it a muscular paralysis.

X.—ORBIT AND NEIGHBORING CAVITIES.

285*a*. PUÉCHAGUT. De la ténonite ou inflammation de la bourse cellulaire retro-oculaire d'origine rhumatismale. *Thèse de Paris*, 1884.

286. HOCK. Case of tenonitis. *Allg. Wiener med. Ztg.*, 1884, No. 26.

287. VOSSIUS, A. Case of orbital phlegmone in thrombo-phlebitis of the orbital vein after extraction of a carious molar tooth, ending in recovery, with preservation of sight as well as of the globe. *Graefe's Arch. f. Ophth.*, vol. xxx., 3, p. 157.

288. Fox, L. Webster. Serous cystic tumors of the orbit, *Med. News*, vol. xliv., No. 26, p. 749.

289. Story, J. R. Rare tumor of orbit. *Ophth. Rev.*, vol. iii., No. 34, p. 245.

290. Badal. Exostose éburnée du frontal. *Ann. d'ocul.*, 1884, vol. xcii., p. 20.

291. Jan Hoene. Notes of ophthalmological cases. *Gazeta Lekarska*, 1884, No. 17. Exophthalmus due to a gumma. Recovery after inunction.

292. Ewetzky. Case of ectasia of the labyrinth of the ethmoid bone. *Wjestnik ophthalmologie*, May and June, 1884.

293. Boucher. Anthrax de la lèvre supérieure; phlébite faciale double. Phlegmon suppuré des deux orbites; accidents cérébraux; nécrose partielle des deux cotés. *Rec. d'ophth.*, May, 1884, p. 270.

294. Hedinger. Traitement de la maladie de Basedow par les courants galvaniques. *Paris méd. et Quinzaine méd.*, Mar. 6, 1884, p. 568.

295. Russel, J. A case of Graves' disease. *Ophth. Rev.*, vol. iii., No. 32, p. 174.

296. Buller, F. Mucocele of the frontal sinus. *Am. Jour. of Ophth.*, May, 1884.

297. Bettman, B. Pulsating exophthalmus. *Jour. Am. Med. Assoc.*, Jan. 26, 1884.

298. Pollak. Melano-sarcoma of the orbit. *St. Louis Med. and Surg. Jour.*, Feb., 1884.

Hock (286) describes a case of tenonitis in a feeble man. He found an inflammatory swelling of the conjunctiva, protrusion of the globes, checked mobility, but good vision. A light pressure bandage was applied, and the patient made to perspire freely, whereupon he recovered completely.

Vossius (287) observed an orbital phlegmone, which rapidly developed after the extraction of a carious tooth, and was preceded by violent toothache lasting a day. There was marked protrusion of the eyeball, checked mobility, and dilatation of the pupil, which was followed by an abscess of the lid, periostitis of the lamina papyracea of the ethmoid bone, and discharge of pus from the nostril of the same side. The globe was preserved, and sight, the impairment of which was due to inflammation of the

optic nerve with thrombo-phlebitis of the lower outer vein, became normal again as the changes in the fundus disappeared. During the inflammation the state of refraction increased, but diminished again when the protrusion of the globe disappeared. The affection lasted six weeks.

Fox (288) reports four cases of cystic tumors of the orbit. The treatment consisted in making an incision into the cyst, evacuating the contents, and applying a point of nitrate of silver thoroughly to the walls. It was successful in all the cases.

BURNETT.

STORY (289) removed a tumor from the orbit of a young girl, which was situated near the margin of the left lower lid towards the nasal side, was inclosed in a capsule, and was bony hard. It consisted of a series of different layers of apparently fibrous tissue and calcified matter of uncertain nature. FITZGERALD.

BADAL (290) reports the successful removal of a large osteoma of the orbit. No relapse had occurred a year later.

MARCKWORT.

EWETZKY (292) reports the following case: The patient was a farmer's wife, twenty-seven years old, whose right eye was pushed outward considerably and slightly downwards by a hemispherical, smooth, painless, fluctuating tumor situated principally above the ligam. palp. intern. and covered with normal conjunctiva and skin. Tear-ducts normal. $V=\frac{15}{30}$. The ophthalmoscope revealed moderate œdema of the papilla and venous retinal hyperæmia. Nasal cavity free. Dr. Logetschnikow, who performed the operation, succeeded in removing only a part of the free wall united to the periosteum of the orbit, and the viscid contents, as the walls of the cavity were connected with the portio orbit. oss. frontis, the lamina perpendic. oss. ethmoidalis, and the pars. orbit. max. sup. The lamina papyr. orbit. was entirely wanting. A drainage-tube was inserted into the cavity, while the walls were washed with antiseptic solutions and cauterized with nitrate of silver. Connection with the nasal cavity was soon established, which persisted after the patient had been discharged. The opening at the inner canthus had also not yet closed. The author declares the case to be one of ectasia of the labyrinth of the ethmoid bone, a conclusion which he bases upon a macro- and micro-scopic examination of an excised piece and of the contents. This would be the fourth case described (1. HULKE, 1864; 2. SCHUH, 1868; 3. KNAPP, 1876). HIRSCHMANN.

Boucher (293) reports a case, very interesting on account of its favorable termination, of anthrax of the upper lip, with subsequent phlebitis of the facial vein of both sides, purulent phlegmone of the orbital cavities, and attendant cerebral symptoms. In Nov., 1881, a furuncle of one ala nasi, and then an anthrax of the upper lip, developed in an otherwise healthy French soldier stationed in Tunis. When the patient came into Boucher's care, his face was very œdematous and red, the facial veins converted into hard cords, the lids very much swollen, the lower ones ectropionized; chemosis of the conjunctiva, and exophthalmus of both eyes; the patient almost somnolent, temp. 40.6°. Subsequently an abscess developed at the bridge of the nose, two abscesses in the right upper lid, one in the left upper lid, and one in the left cheek, which, like the anthrax of the lip and the furuncle of the nose, were incised at an early date. From the bridge of the nose a probe could be passed 2 *cm.* deep into the right orbit, and from the point of incision in the left upper lid a bent probe could be pushed behind the left eyeball to the optic nerve. The facial veins, as well as the edges of the abscesses, were treated energetically with Paquelin's thermocautery. The eyeballs being imperfectly covered, an ulcer developed in both in the lower half of the cornea, which soon perforated. Nevertheless, his general condition gradually improved, so that the patient not only remained alive, but had on Jan. 4th in the right eye V=½, in the left ¼. Boucher being called away, transferred the patient on Jan. 7th to another physician, and heard later that on Jan. 11th double glaucoma developed, and that he was discharged on March 13th in the following condition: anterior staphyloma of both eyes, greater in left than in right; incarceration of iris in both. Diffuse opacities of the corneæ. V much reduced, especially in left eye.

Marckwort.

Hedinger (294) observed a very severe case of Graves' disease. Marked improvement on galvanization of the sympathetic nerve,—anode on the gangl. suprem., kathode on retromaxillary fossa; two applications daily of 10 minutes each, with 4–8 elements. v. Mittelstädt.

Russell (295) describes a case of Graves' disease in a feeble girl of sixteen. In the beginning there was proptosis on both sides, which after four months subsided on the right, while the left eye remained bulging. There was a small struma; the dull percussion sound over the heart exceeded the normal limits;

there was a presystolic murmur over the mitral valve, and a systolic murmur in the region of the pulmonary artery.

BULLER (296) describes a mucocele of the orbit, which caused protrusion of the left eye, and had destroyed the inner wall of the orbit. A trocar was plunged in, giving exit to thick, viscid mucus. A drainage-tube was then introduced, and the patient gradually improved, though still under observation when the case was reported. BURNETT.

BETTMAN (297) relates a case of arterio-venous aneurism, caused by a fracture at the base of the skull. There was papillitis of both sides. Marked exophthalmus in both eyes; more in left. A ligation of the common carotid was made with relief to symptoms, but twelve and a half days after the operation the circulation was suddenly re-established, producing a return of all the unpleasant symptoms. BURNETT.

POLLAK (298) exhibited a man whose entire orbit was filled with a growth of sarcomatous nature. Ten years ago he removed the eye on account of glio-sarcoma of the retina and choroid, and six years later a small relapse filling about one fifth of the orbit. There are also a few nodules in the right hypochondrium, making it probable that the viscera have been attacked. BURNETT.

XI.—CONJUNCTIVA, CORNEA, SCLERA.

299. BEUMER and PEIPER. On blennorrhœa neonatorum. *Arch. f. Gynækol.*, vol. xxiii., p. 479.

300. KÖNIGSTEIN. The present status of our knowledge of the blennorrhœa of the new-born. *Wiener med. Presse*, 1884, Nos. 31, 32, 33, 35.

301. LEOPOLD and WESSEL. Contribution to the etiology and prophylaxis of blennorrhœa neonatorum. *Arch. f. Gynækol.*, vol. xxiv., p. 92.

302. CREDÉ. The prevention of blennorrhœa neonatorum, the most frequent and most important cause of blindness. Berlin, 1884. Hirschwald.

303. HALTENHOFF, G. On gonorrhoic conjunctivitis without inoculation. *Arch. f. Augenhk.*, vol. xiv., p. 103.

304. MAGNI, G. Di una nuova forma di conjonctivite scrofolosa. *Riv. clin.*, No. 5, May, 1884.

305. STEFFAN, PH. The relation of pemphigus of the conjunctiva to the so-called essential xerosis of the conjunctiva.

(Graefe's syndesmitis degenerativa). *Zehender's klin. Monatsbl. f. Augenhk.*, vol. xxii, p. 271.

306. SCHÖLER. Demonstration of a case of essential xerosis of the conjunctiva. *Berliner klin. Wochenschr.*, 1884, No. 33.

307. DEHENNE, O. Du traitement des granulations conjonctivales par le thermo-cautère. *Rev. d'ocul.*, 1884, No. 6, p. 137.

308. WARLOMONT. Collyres contre le pannus. *Union méd.* 1884, No. 51, p. 619.

309. VOUCKCHEWITSCH. Étude sur le traitement de l'ophthalmie granuleuse. *Rec. d'ophth.*, April and Aug.

310. JACOBSON. Contribution to the knowledge of conjunctivitis granulosa. *Deutsche med. Ztg.*, 1884, No. 41, p. 568.

311. SCHENKL. On thirty cases of trachoma treated with jequirity. *Prager med. Wochenschr.*, 1884, No. 29.

312. HEISRATH. On jequirity. *Berl. klin. Wochenschr.*, 1884, No. 37.

313. WIDMARK, J. Om jequirity-oftalmien. *Nord. med. Arkiv.*, vol. xvi., No. 5. Stockholm, 1884.

314. NYS. Traitement du trachome et des différentes affections cornéennes par les lotions du jequirity. *Rev. d'ocul.*, 1884, No. 6, p. 435.

315. HARDY. Ferment soluble de jequirity. *Gaz. hebd.*, 1884, No. 13, p. 211.

316. DENEFFE. Le jequirity et le jequiritisme dans le traitement du trachome. *Bull. de l'acad. royale de Belgique*, 1884, No. 3, p. 301.

317. BRUNSCHWIG. Considérations sur le jequirity. Son action physiologique. Ses effets thérapeutiques dans le traitement de la conjonctivite granuleuse. *Thèse de Nancy*, 1884.

318. FERNANDEZ, SANTOS. Analisis sobre el tratamiento de los granulos con el jequirity par el Dr. A. de la Peña. *La oftalm. prat.*, anno iii., No. 24, p. 29.

319. PENA, A. DE LA. Tratamiento de los granulos con el jequirity. *Revista de cienc. méd.*, June, 1884.

320. LANDESBERG, M. Warning to the medical practitioners in regard to the use of jequirity. *Phila. County Med. Soc.*, 1884.

321. SEVERI. Del jequirity in rapporto alla tossilogia e alla medicina legale. *Lo Sperimentale*, No. 1, 1884.

322. POLLAK, S. The therapeutic value of jequirity. *Am. Jour. of Ophth.*, June, 1884.

323. ANDREWS, J. A. Trachoma and the etiology of jequirity ophthalmia. *Arch. of Med.*, June, 1884.

324. MOYNE, G. Cistico della congiuntiva. *Boll. d'ocul.*, vol. vi., No. 8, p. 178.

325. LAGRANGE. Du sarcome mélanique de la conjonctive. *Arch. d' ophth.*, vol. iv., No. 4, p. 336.

326. MINOR. Case of gumma of the conjunctiva. *Arch. f. Augenhk.*, vol. xiv., 2, p. 174.

327. HIRSCHBERGER and BIRNBACHER. Case of condylomatous papilloma of the conjunctiva. *Centralbl. f. prakt. Augenhk.*, 1884, p. 200.

328. BERGMEISTER. Case of congenital dermoid tumor of both eyes. *Wiener med. Blätter*, 1884, No. 24, p. 748.

329. LABAT, A. Eruption de horse-pox sur la conjonctive d'un poulain. *Rev. sanitaire de Bordeaux*, 1884, No. 6.

330. KUSCHBERT. Xerosis of the conjunctiva and the symptoms attending it. *Deutsche med. Wochenschr.*, 1884, Nos. 21 and 22.

331. DENK, O. Contributions to the mycotic affections of the eye. *Inaug.-Diss.*, Munich, 1884.

In his monograph on the prevention of blennorrhœa neonatorum, CREDÉ (302) recommends putting the children into the bath immediately after ligating the umbilical cord, carefully cleansing the eyes with a linen rag, or, better still, prepared cotton, and then instilling a 2-per-cent. solution of nitrate of silver with a glass rod. The female genital organs are washed only for the sake of cleanliness, though this is scarcely necessary, as they are of no consequence for the prevention of infection.

According to BEUMER and PEIPER (299) 9–22.4 per cent. of all the new-born were affected with blennorrhœa at the Greifswald gynæcological clinic from 1870 to 1880; since the introduction of Crede's method in 1881–1882, only 1.7–1.9 per cent.

LEOPOLD and WESSEL (301) observed only seven cases of blennorrhœa among 1,002 new-born children within the first ten days at the lying-in asylum at Dresden after the introduction of CREDE'S method.

KÖNIGSTEIN (300) also recommends Crede's method. When it fails in preventing the disease he brushes a 2-per-cent. solution

of nitrate of silver over the conjunctiva in the stage of swelling, and a 4–5-per-cent. solution in the stage of secretion.

MAGNI (304) has discovered a new form of conjunctivitis. After an acute conjunctival catarrh a large number of minute nodules developed in the quadrant between the insertions of the superior and external recti muscles, which gradually grew to the size of a milium and then disappeared again in the course of a few weeks without leaving any trace. Under the microscope the exudation was found to be a conglomeration of epithelial cells in follicular arrangement. [Primary (infiltration) stage of crescentic ulcer.—ED.]

STEFFAN (305) describes a case of essential xerosis of the conjunctiva, in which pemphigus pustules developed afterwards upon the lids. He thinks that the affection was caused by a pemphigus eruption on the conjunctiva.

SCHÖLER (306) also observed essential xerosis of the conjunctiva in an older woman. Pemphigus could be excluded; the cause must be sought in destruction of the subconjunctival tissue.

DEHENNE (307) has used the galvano-cautery in trachoma for three months with good results. He touches only the conjunctiva, when it alone is affected, and performs pericorneal cauterizations every five or six days in pannus. v. MITTELSTÄDT.

WARLOMONT (308) recommends 2–3 instillations daily of sulphate of copper in glycerine in concentration of 1:8, 1:6, and 1:4 according to the reaction of the eye. In dense pannus and prolific granulations he also spreads a thin layer of finely divided sulphate of copper upon the conjunctiva and cornea.

v. MITTELSTÄDT.

VOUCKCHEWITSCH (309) discusses granular conjunctivitis at length with special regard to the history of the treatment of this disease. He recommends excision of the fornix, and cites the clinical history of seventeen cases in support.

MARCKWORT.

JACOBSON (310) warns against the use of jequirity, as it endangers the cornea, and describes such a case.

SCHENKL (311) treated thirty cases of trachoma with jequirity. The results, however, were so unsatisfactory that the trials were discontinued, there being no doubt that jequirity was inferior to sulphate of copper. HEISRATH (312) came to similar conclusions.

WIDMARK (313) draws the following conclusions from his ex-

periments on rabbits: 1. The jequirity infusion, introduced into the system of animals, acts as a poison. 2. Applied locally to mucous membranes (conjunctiva, intestines), it produces a violent catarrh. 3. The infusion is well adapted for the development of various kinds of microbes, with the increase of which the efficiency of the infusion decreases. 4. These microbes generally cannot live in the system; they are not found in the conjunctiva or in the conjunctival secretion after the introduction of the infusion into the conjunctival sac, neither are they found in the local abscesses or in the blood after subcutaneous injections. The animal does not die under the symptoms of infection, neither do the pathologico-anatomical changes indicate this. 5. In other words, the action of jequirity is not due to a bacillus. In view of the results of some therapeutical experiments the author expresses the opinion that jequirity only occasionally has a beneficial influence on trachoma, but that it sometimes clears up the cornea. SCHJÖTZ.

NYS (314) recommends jequirity in atonic ulcers and facets of the cornea, and in obstinate cases of phlyctenular kerato-conjunctivitis. He saw complete recovery from an intense parenchymatous keratitis after the application of a three-per-cent. infusion, after every other kind of treatment had failed. v. MITTELSTÄDT.

According to HARDY (315) the so-called alkaloid of jequirity is a soluble ferment, which is converted into peptone by sulphuric acid, and loses its power when heated to 100°.

v. MITTELSTÄDT.

DENEFFE (316) did not obtain any results with jequirity in old cases of trachoma; fresh cases were cured, but ulcers developed upon the previously intact cornea. The results with jequiritine, however, were better. v. MITTELSTÄDT.

BRUNSCHWIG'S (317) experiments show that the active principle of jequirity is a soluble ferment, analogous to pepsine; the development of bacteria is only secondary. Its action is that of a local irritant, and dependent in intensity more upon the individual irritability of the conjunctiva than the concentration of the solution. He frequently saw genuine trachoma cured, while the remedy failed in conjunctivitis combined with the development of follicles and papillæ. v. MITTELSTÄDT.

According to PEÑA (318 and 319) jequirity generally cures trachoma completely and permanently; it is the specific remedy for the disease; it is more effective in torpid, chronic conditions with slight discharge than in acute cases. Jequirity also cures other

ocular affections—for instance, pannus, pustular keratitis, etc.; it is a remedy which, when prepared in the customary way, does not endanger the eye. The maceration must always be used cold, as heat destroys its therapeutic action. Thus far no substitute for jequirity has been found.

LANDESBERG (320) warns against the use of jequirity, as it endangers the cornea.

The investigations of SEVERI (321) of the general action of jequirity show that one cubic *cm.* of a five-per-cent. infusion, injected subcutaneously, kills warm-blooded animals, like rabbits, pigeons, and mice, in 18–48 hours; frogs, however, only after 8–14 days. Much larger quantities can be borne when introduced into the stomach. The temperature is greatly reduced, the animal loses rapidly in flesh, and albuminuria ensues, but death does not always follow. The author thinks that the active principle of jequirity is of a chemical nature. DANTONE.

POLLAK (322) treated fifty-one cases of trachoma with jequirity; in one the cornea sloughed. He uses a three-per-cent. solution. BURNETT.

ANDREWS (323) looks upon trachoma as a simple blennorrhœa, produced by bad hygiene, and not by micrococci. He treated fifty-seven cases with jequirity, three without result, while in one extensive ulceration of the cornea developed. He thinks the active principle is a vegetable substance. BURNETT.

MOYNE (324) has seen five cysts of the conjunctiva in twenty-six years of ophthalmic practice; three were situated in the fornix, two on the ocular conjunctiva. In every case they were congenital. DANTONE.

LAGRANGE (325) reports the case of melano-sarcoma of the conjunctiva already described in the *Rev. d' ocul.*, 1884, No. 4, p. 89, and another from Badal's practice; and from these two, and a few other cases compiled from the literature of the subject, he comes to the conclusions already referred to. He recommends enucleation, although the tumors grow slowly, and seem at first to be benignant. v. MITTELSTÄDT.

HIRSCHBERG and BIRNBACHER (327) removed a row of raspberry-shaped, pale-red neoplasms from the conjunctiva of the globe and lids, which proved to be papillomata.

LABAT (329) observed in a colt, horse-pox of the conjunctiva of the globe and lids, and also of the limbus. They varied in size from that of a pin-head to that of a lentil. They were flattened at

the apex, but without a depression. There were somewhat larger pustules on the nose and upper lids. When a young cow was vaccinated with them, typical cowpox was developed.

KUSCHBERT (330) observed in xerosis of the conjunctiva affections of the respiratory organs, discoloration and dryness of the skin, intestinal catarrhs, and sometimes affections of the gums. Probably the bacilli found upon the conjunctiva and in the tissues are the cause of the disease. He considers xerosis of the conjunctiva and the affections accompanying it a typical infectious disease.

DENK (331) made an anatomical examination of a case of xerosis of the conjunctiva, and found the characteristic microbes.

332. KUHNT, H. Further reports on the healing of deep corneal ulcers threatening to perforate, by covering them with conjunctiva. *Berliner klin. Wochenschr.*, 1884, No. 24.

333. FISCH, R. Linear cauterization : a contribution to the treatment of destructive corneal processes. *Inaug.-Diss.*, Basel, 1884.

334. RAMPOLDI. Un caso di rapida e totale mortificazione dell' occhio. *Ann. di ottalm.*, vol. xiii., 2, p. 458.

335. KIBERSZTOWICZ, F. Combustion of the cornea. *Gazeta Lekarska*, 1884, No. 14.

336. THEA. Dell' applicazione del massagio in alcune affezioni oculari. *Gazz. d. cliniche*, 1884, Nos. 1–3.

KUHNT (332) publishes some more good results obtained by covering corneal ulcers threatening to perforate with conjunctiva, a method first recommended by Berlin and Schöler, and later by himself.

FISCH (333) reports that Prof. Schiess-Gemuseus performs linear cauterization in all cases of destructive corneal processes that are complicated with swelling of the conjunctiva and mucopurulent discharge. He produces a narrow eschar along the whole length of the fornix with a sharpened stick of pure lunar caustic, and then neutralizes.

RAMPOLDI (334) describes a case of total primary necrosis of the cornea, the cause of which he could not discover.

DENTONE.

KIBERSZTOWICZ (335) describes a case of combustion with a glowing pair of tongs. Almost the whole cornea was covered with a white eschar, which was cast off five hours later. No more

irritation the following day. From a report in the *Wjestnik ophthalm.* HIRSCHMANN.

THEA (336) favors massage. Excellent results were obtained with this method in eight cases treated at Bono's clinic (two of blepharitis ciliaris, five of scrofulous affections of the conjunctiva and cornea, one of pannus after trachoma, and one of parenchymatous keratitis). Bono follows Pagenstecher's directions, but uses vaseline instead of yellow ointment. DANTONE.

337. CAMPART. De l'épiscléritis. *Thèse de Paris*, 1884.

CAMPART (337) discusses rheumatic episcleritis, which he considers an inflammation of the anterior portion of Tenon's capsule. v. MITTELSTÄDT.

XII.—IRIS.

By Dr. NIEDEN.

338. ALEXANDER. Genuine tuberculosis of the iris and ciliary body. *C. f. A.*, vol. viii., p. 161.

339. CUIGNET. Hémorrhagies antérieures de l'œil opératoires et postopératoires. *Rec. d'ophth.*, Sept., 1884, p. 523.

340. MAKROCKI, F. (Breslau). Anomalies of the iris. *Arch. f. Augenhk.*, vol. viv., 1, p. 73.

341. PFLÜGER (Berne). Case of sarcoma of the iris. *Jahrb. d. Berner Univ. Augenkl.*, 1883, p. 20. Berne, Dalp, 1884.

342. SCHÄFER, H. Anatomical description of an eye with suppurative irido-choroiditis. *C. f. A.*, vol. viii., p. 203.

343. SOUQUIÈRE. La corelyse, étude clinique et critique du procédé du Prof. Förster de Breslau. *Thèse de Lyon*, 1884.

MAKROCKI (340) describes three cases of congenital coloboma of the iris; in one case in one eye only outward, in another inward, and in a third (case of Magnus) one coloboma inward and another on the same eye downward. All the symptoms pointed to a congenital origin, and in cases 1 and 2 are explained as the result of an abnormally situated fœtal fissure. He also reports a case of membrana pupillaris perseverans corneæ adherens in the left microphthalmic eye of a girl of fifteen, in whose right eye there was an ordinary pupillary membrane.

SCHÄFER (342) gives an anatomical description of an eye removed on account of iridocyclitis dolorosa c. amaurosi. When

the globe was opened, a peculiar thickening of the choroid to the extent of 2–3 *mm.* was found in the region between the ciliary body and choroid ; the partially detached retina was united with it. The pathologico-anatomical examination showed that there was well-advanced suppurative irido-choroiditis, which had produced almost total destruction of a circumscript portion of choroid and retina, and gradual change of the products of inflammation into newly formed connective tissue, which projected into the vitreous like a tumor. Hyaline degeneration of Descemet's membrane had taken place, producing thickening of the cornea (colloid degeneration).

ALEXANDER (338) observed genuine tuberculosis of the iris and ciliary body in the left eye of a boy four years old ; it was enucleated after a piece of the infiltrated iris-tissue had been excised and introduced into the anterior chamber of a rabbit's eye. The microscope clearly demonstrated the tuberculous character of the neoplasm, but no bacilli were found. Four weeks after the introduction of the tuberculous piece of iris into the eye of the rabbit, the animal showed diffuse tuberculosis of the iris, a few tubercles in the peritoneum of the liver, and vast numbers of tubercle-bacilli in the iris and ciliary body.

PFLÜGER (341) reports a case of sarcoma of the iris in a woman of fifty-five, which was successfully removed. He also adds a description of the eleven or thirteen cases respectively, which Fuchs does not mention in his "sarcoma of the uveal tract."

CUIGNET (339) discusses the hemorrhages into the anterior chamber during and after operations, their causes, source, and consequences. The most profuse hemorrhages Cuignet observed after "total iridectomy, or extraction of the whole iris," an operation which he performed at least twenty-five times in fifteen years. MARCKWORT.

SOVQUUIÈRE (343) cannot recommend FÖRSTER's corelysis, as the results in all the cases he has seen were unsatisfactory, and even made matters worse. Souquière saw ten good results in fifteen cases of ripening of cataract according to Förster ; in three, iritis ensued. Experiments on rabbits produced total cataract in two cases ; in one, partial opacity of the lens. v. MITTELSTÄDT.

XIII.—CHOROID.

344. CARO. La pilocarpina nelle malattie oculari. *Giorn. internat. de scienz. med.*, vol. vi., 6. Seven clinical histories relating

the good results of injections of pilocarpine in choroidal and retinal exudations.

345. FANO. Relations entre la cataracte polaire et l'irido-choroidite. *Jour. d'ocul.*, Aug., Sept., 1884.

346. GIRARD, C. Choroidite de la macula, considération pathogénique, indications thérapeutiques. *Rev. trimestr. d'ophth. prat.*, p. 6, April, 1884.

347. MACKENZIE (ST.), WARNER, BRAILEY. Chronic tubercle of choroid and brain. *Trans. Ophth. Soc. Unit. Kingd.*, 1883, vol. iii., pp. 119, 126, 129.

348. PFLÜGER, E. (Berne). Metastatic sarcoma of the choroid. *Arch. f. Augenhk.*, vol. xiv., 2, p. 129.

349. SCHÄFER, H. Chronic tuberculosis of the eye. *Zehender's klin. Monatsbl.*, vol. xxii., p. 307.

350. TERSON. Chorio-rétinite grave guérie rapidement par les inonctions d'onguent napolitain. *Rev. klin. d'ocul.*, p. 66, No. 3, March, 1884.

In a case of posterior polar cataract, FANO (345) performed an iridectomy downward. An exudation was found on both sides of the excised piece. V was worse after the operation than before it.

GIRARD (346) observed choroiditis at the macula lutea in two cases of moderate degrees of myopia in persons who took but little exercise, and suffered from congestion of the head and cold feet. He therefore attempted to regulate the circulation by cold douches and long walks. v. MITTELSTÄDT.

In discussing tuberculosis of the uveal tract, MACKENZIE (347) reports the case of a boy four years old, in which the diagnosis of tuberculosis of the brain was made from the presence of tubercles in the choroid, detected with the ophthalmoscope. The autopsy confirmed the diagnosis. WARNER reports a similar case of a child aged nine, in whom the tubercles were recognized with the ophthalmoscope. There was no optic neuritis. In the right eye the disc was reddish. There was general miliary tuberculosis, but no meningitis. Brailey excised and examined the eye of a child aged two. The globe had enlarged rapidly, and the ophthalmoscope showed the retina apparently detached. A tumor the size of a pea was found near the papilla, which proved to be tubercular. A few isolated patches of a similar nature were found in the adjacent sclera. FITZGERALD.

PFLÜGER (348) adds another case of metastatic sarcoma of the choroid to the two already published. The tumor developed in a person aged twenty-nine, from a nævus in the region of the right parotid, attacked the glands, and produced metastases in the back, the scalp, the brain, and the right choroid. It grew for about three years. The left eye became amaurotic from metastases in the brain; the right, later, from metastases in the choroid. Pflüger also observed amaurosis of the second eye from metastasis in the brain, in a case of primary sarcoma of the choroid in the first.

TERSON (350) saw a girl aged sixteen recover from a severe attack of chorio-retinitis after mercurial inunctions and, later, iodide of potash. The disease had lasted five weeks before treatment was begun, and the patient had only quantitative perception of light. No diastatic cause could be discovered.

V. MITTELSTÄDT.

XIV.—GLAUCOMA.

351. V. ARLT. On glaucoma. With six plates and twelve illustrations. Vienna, 1884, Braumüller. 142 pages.

352. CANT, W. J. Atropine and glaucoma. *Ophth. Rev.*, Sept., 1884, p. 265.

353. DEHENNE. Du glaucome infantile et de sa transformation en glaucome d'adulte. *Rec. d'ophth.*, Aug., 1884, p. 535.

354. JACOBSON, J., Sr. Clinical contributions to the knowledge of glaucoma. *v. Graefe's Arch. f. Ophth.*, vol. xxix., 3, pp. 1–70, and vol. xxx., pp. 165–210.

355. PFLÜGER, E. (Berne). Acute glaucoma, optic neuritis, nephritis, lead-poisoning; anatomical condition. *Jahrb. d. Berner Univ. Augenkl.*, 1883, p. 35. Berne, Dalp, 1884.

356. PROUT, J. S. Glaucoma simplex in a hypermetropic eye after tenotomy. *Amer. Jour. of Ophth.*, May, 1884.

357. SACHS, TH. Glaucoma produced by homatropine. *C. f. A.*, vol. viii., p. 271.

358. SIMI. Sulla cura medica del glaucoma. *Boll. d'ocul.*, vol. vi., No. 10, June, 1884.

In his monograph on glaucoma ARLT (351) expresses his views as to the nature of this disease, basing them on his own vast experience, numerous experimental investigations, and reports of pathologico-anatomical conditions prepared under his directions. The literature of the subject is fully considered from pre-ophthal-

moscopic times up to the present. He regards glaucoma as primary in its form, and subdivides it into three stages: the stage of stasis, of inflammation, and of degeneration. Arlt firmly supports v. Graefe's theory, that in glaucoma amaurosis is produced by the increase of the intra-ocular pressure. For details *v.* this excellent monograph itself.

JACOBSON (354) summarizes the results of his studies on glaucoma as follows: 1. The disturbance of central and peripheral vision can be explained in chronic glaucoma by the excavation of the optic nerve. The excavation is one of pressure. 2. The marginal excavation is a later symptom. 3. The prodromal stage of chronic glaucoma is characterized by subjective obscurations, excavation of the central canal, dilatation of the pupil, and increased tension. These symptoms may occur either singly or variously combined. 4. Iridectomy is most effective in the initial stage, but frequently fails when the marginal excavation has developed. 5. Accommodative efforts in hypermetropic eyes no longer young assist in producing the initial stage on account of venous stasis. 6. The glaucomatous eyeball retains its hardness after enucleation longer than the normal one. 7. Increase of volume of the vitreous is the cause of the greater hardness. 8. The vitreous presses backward into the central canal and pushes the ciliary processes forward against the insertion of the iris, thus closing Fontana's spaces. 9. The turbidity of the refractive media in acute glaucoma and prodromal attack is an œdema, and not of an inflammatory nature. 10. The obscurations of the initial stage without turbidity of the media indicate venous hyperæmia and arterial anæmia. 11. The increased volume of the vitreous is a constantly acting cause for further venous hyperæmia and œdematous and inflammatory secretion. 12. The transition from acute to chronic glaucoma can be directly explained by the increased tension; from chronic to acute, by passive hyperæmia of the anterior section of the globe, the result of the increased volume of the vitreous.

DEHENNE (353) maintains that infantile glaucoma (hydrophthalmus) can also occur in adults, if the conditions are the same as those in a child—namely, if the sclera is elastic and yields. When, again, the sclera and cornea in a child have been distended *ad maximum*, the excavation of the optic nerve begins: the glaucoma of adults develops. Three clinical histories.

MARCKWORT.

CANT (352) records the case of a woman aged sixty-five, on whose right eye two iridectomies had been performed, so that finally enucleation became necessary. Incipient glaucoma of the left eye was cut short with eserine. When later preparatory iridectomy was performed on account of incipient cataract, a few drops of atropine were instilled into the eye on the eleventh day by mistake, with the result of at once bringing on an attack of acute glaucoma, which again yielded to eserine. FITZGERALD.

PFLÜGER (355) also saw acute glaucoma develop after instillation of a drop of atropine in a patient who for years had been affected with the prodromi of glaucoma, which readily yielded to eserine. An intercurrent neuritis, due to lead-poisoning, did not influence the course of the glaucoma, neither did a slight albuminuria, which developed afterward. Anatomical description of the globes.

PROUT (356) thinks that, considering the fact that the left eye is still good, the operation had an influence in developing the glaucoma in the right eye. BURNETT.

SACHS (357) saw glaucoma develop after the instillation of a drop of homatropine for the purpose of examining a hypermetropic eye with the ophthalmoscope. It readily yielded to eserine.

According to SIMI (358) medicamentous treatment of glaucoma with eserine, iodoform, massage, and constitutional remedies is possible in those cases in which the disease is due to transient blood or lymph-stasis, and is precipitated by external causes. Of the three cases cited by the author, which were completely and permanently cured by medicamentous treatment alone, two suffered from heart disease, and the glaucomatous attack took place while they were suffering from enfeebled circulation due to the internal use of antimony. In the third case the patient was predisposed through mental excitement, though the immediate cause was the instillation of atropine. DANTONE.

XV.—SYMPATHETIC OPHTHALMIA.

359. DRAKE-BROCKMANN. Foreign bodies in the eyeball. *Ophth. Rev.*, July, 1884, p. 202.

360. ALT, A. Case of sympathetic neuro-retinitis—remarks on sympathetic ophthalmia. *Amer. Jour. Ophth.*, April, May, 1884.

BROCKMANN (359) reports four cases. In one of them, in which there was considerable sympathetic trouble, with great defect of V,

very marked benefit followed the enucleation of the injured eye together with the inunction of blue ointment and two-gr. doses of quinine thrice daily. FITZGERALD.

ALT (360) reports a case of sympathetic neuro-retinitis, which developed on the sixth day after enucleation of the offending eye, though symptoms of sympathetic ophthalmia were observed a few hours after removal of the eyeball. The patient was finally discharged with V = $\frac{20}{40}$. BURNETT.

XVI.—LENS.

361. APPENZELLER. Contribution to the knowledge of heredity of senile cataract. *Mittheilungen a. d. ophth. Klinik zu Tübingen* von Prof. Nagel, vol. ii., 1. Tübingen, 1884.

362. BANDON. Des hémorrhagies intra-oculaires après l'opération de la cataracte. *Rec. d'ophth.*, August, 1884, p. 454.

363. CHIBRET. Technique de l'opération de la cataracte. *Arch. d'ophth.*, vol. iv., No. 3, p. 248, and No. 5, Sept., Oct., 1884, p. 444.

364. BULL, C. S. FÖRSTER's operation for the rapid ripening of cataract, with an analysis of thirty cases. *N. Y. Med. Jour.*, May 24, 1884.

365. DRAKE-BROCKMANN. Cataract-extraction. *Ophth. Rev.*, Aug., 1884, p. 229.

366. DUBRUEIL. De l'opération de la cataracte. Clinique faite à l'hôpitale St. Eloi de Montpellier. *Gaz. méd. de Paris*, No. 25, p. 289, June 21, 1884.

367. v. DUYSE. Panophthalmite tardive après une opération de cataracte avec enclosement irien. *Ann. d'ocul.*, vol. xcii., p. 44.

368. FRYER, B. E. Two cases of double congenital symmetrical ectopia lentis in sisters. *Amer. Jour. Ophth.*, May, 1884.

369. GOTTI. Dell' emorragia consecutiva all' estrazione della cataratta. *Riv. clin.*, June, 1884.

370. GRANDELEMENT. Observation de luxation du cristallin. *Rev. d'ocul.*, p. 101, April, 1884.

371. JEGOROW, J. E. Report on 152 extractions of cataract. *Wjestnik ophthalm.*, May and June, 1884.

372. KAZAUROW, J. N. Hemorrhage in the eye after cataract-extraction. *Wratsch*, No. 36, 1884.

373. KAZAUROW, J. N. The question of erythropsia due to aphakia. *Wratsch*, No. 15, 1884.

374. MAKLAKOFF. Un procédé operatoire de la cataracte. *Arch. d'ophth.*, 1884, vol. iv., No. 3, p. 242.

375. MARTIN, G. Hygiène des instruments, qui servent à l'extraction de la cataracte. *Gaz. d'ophth.*, April, 1884.

376. MCKEOWN. Treatment of immature cataract. *Ophth. Rev.*, Aug., 1884, p. 238.

377. MITTENDORF, W. F. On Förster's method of artificially ripening cataracts. *Med. Record*, June 28, 1884.

378. NOEDMENN, G. A. (Helsingfors). Case of cataracta Morgagni (hypermatura fluida) with clear cortical liquid. *Arch. f. Augenhk.*, vol. xiv., 2, p. 165.

379. PFLÜGER (Berne). The question of erythropsia. *Jahrb. d. Univ. Augenkl.*, p. 49. Berne, Dalp, 1883.

380. SNELL, SIMON. Thermometry in cataract-extractions. *Ophth. Rev.*, 1884, vol. 3, p. 105.

APPENZELLER (361) assumes various kinds of heredity of cataracts, according to the nearness of relationship, and sifts the extensive literature of the subject accordingly, adding himself eight new cases from the Tübingen ophthalmic clinic. Mediate heredity is that form in which glaucoma, myopia, lues, and diabetes mellitus are transmitted by heredity and thereby disposed to the consecutive development of cataract.

In five of the cases described by BULL (364) plastic iritis followed the operation. In no case was the zonula ruptured. The time for the apparent complete ripening of the cataract after the operation was from six days to five weeks. In the subsequent extraction no case had V $< \frac{20}{100}$. The extraction was not attempted until four weeks after the first operation.

BURNETT.

GRANDELEMENT (370) observed in a case of traumatic dislocation of the lens sudden blindness, while the fundus could not be illuminated. This condition lasted for five hours, when it yielded to eserine; myopia of high degree was then found, which gradually disappeared after the seventh day. The author explains the first symptoms by assuming glaucoma fulminans, and attributes the disappearance of the myopia to the return of the lens to its former position, when it again became attached.

MITTELSTÄDT.

FRYER (368) describes two cases of ectopia lentis. In the one the lenses were dislocated outward, in the other, upward and outward.

NORDMANN (378) reports a case of cataracta Morgagni (hypermatura fluida) with clear, watery, cortical liquid in which V was but slightly impaired, the capsule of the lens being perfectly transparent.

CHIBRET (363) discusses minutely every thing pertaining to the preparation, technique, method, and after-treatment of cataract; then describes the simple linear extraction, in which he only makes a small corneal section, and after removing the cataract, tears the posterior capsule with the cystitome. He also gives his views as to the cause and treatment of accidents after the extraction, and of the various complications in healing. Finally, he discusses the hygiene of the operator and his mode of life, and thinks he should rest one or two days every week and take a vacation both in summer and winter. V. MITTELSTÄDT.

DRAKE-BROCKMANN (365) gives a statistical review of 1,767 cases of cataract-extraction performed by him at the Eye Infirmary, Madras. Various methods were adopted, but mainly one, which he designates as "primary capsule rupture," which he has so named because the initiatory step of the operation is a division of the lens capsule by a stop-needle, the pupil having been previously fully dilated with atropine. He operated 674 cases according to this method, with an unsuccessful percentage of 11.72. The author claims the following advantages for this procedure: 1. It allows a more extensive laceration of the capsule at the same time that the anterior chamber remains replete with fluid. 2. It permits of a more complete exposure, and a more thorough knowledge is gained of the size and character of the cataract. 3. It diminishes the tendency of the iris to contract, even after the corneal section has been completed, and by this means facilitates the escape of the lens. 4. The possibility of more accurately judging of the extent to which the cornea must be divided. 5. Less necessity for the introduction of a traction instrument.

FITZGERALD.

MAKLAKOFF (374) endeavors to make that a method which others seek to avoid in extraction: he seeks to dislocate the lens in the capsule with a sharp hook, after having previously divided the capsule. He attaches special importance to this, maintaining that it facilitates the escape of the lens, and that fre-

quently it is possible to extract the lens in the capsule without loss of vitreous. This kind of success is probably, in most cases, unintentional; and whatever else may happen during this manœuvre and what the results are is not stated, no observations being reported. v. MITTELSTÄDT.

JEGOROW (371) performed 152 operations at the hospital at Sirapul, department of Wjatka, on 125 patients (76 men, 49 women, 24 Baschkirs and Tartars, 101 Russians), 88 hard and 34 soft cataracts, 6 Morgagnian cataracts, 1 cat. nigra, 2 pyramidal cataracts, 2 cat. siliquatæ, 1 chalky lens, 1 secondary cataract. In young persons division was performed (12 cases); in older ones, linear extraction according to Graefe, in 132 cases, and flap-extraction in 6. Strict antiseptics. Iritis with total loss of V in 5 cases after perfectly normal extraction (method not given). In 5 cases suppuration of the wound, exclusively in affections of the lachrymal sac, only two of which lost V completely.

HIRSCHMANN.

MCKEOWN (376) proposes the injection of warm water into the capsule, by means of a hypodermic syringe, for the purpose of loosening the lens and washing away the cortex. Though he has had only three months' experience of this proceeding, he is satisfied of its value, and he has been enabled to undertake operations of which he previously would not have dreamt (!).

FITZGERALD.

MARTIN (375) reports two cases of suppuration after extraction, in which cauterization according to Abadie was without avail. He attributes the infection to the instruments, and therefore recommends (1) that they should not be used in any other operation, and (2) that they should be kept in a special box, which should not be opened until just before the operation. MARCKWORT.

MITTENDORF (377) reports twenty cases in greater or less detail. The time of ripening was from twenty-five days to ten weeks. Serious inflammation of the iris followed the operation in three cases, one of which went on to destruction of the ball. In the twelve cases which have come to extraction, no serious complications arose, and visual results were good. BURNETT.

SNELL (380) recommends measuring the temperature in all cases of cataract-extraction, as experience has shown him that in all cases in which suppuration or severe iritis set in, this was at once clearly indicated by the tracings on the temperature chart, while if the case is progressing well there is no elevation of temperature. FITZGERALD.

BANDON (362) is opposed to the opinion of Fieuzal, Dianoux, and Warlomont, that intra-ocular hemorrhage after extraction always causes panophthalmitis, and that therefore enucleation should be at once performed. BANDON reports two cases of hemorrhage after extraction; one eye improved again so that the patient could tell the time on his watch with + 15 D; the other was preserved, but remained blind. ARMAIGNAC expresses similar views (*Rev. clin. d' ocul.*, July, 1884). (BECKER reports a similar case with preservation of the globe. Graefe-Saemisch, vol. v., p. 344.—REV.) MARCKWORT.

GOTTI (369) observed an intravascular hemorrhage after cataract-extraction, which took place immediately after the operation, and next day had filled the whole anterior chamber with blood; it was absorbed however in the course of a few weeks, so that the patient could be discharged cured. DANTONE.

The right eye of KAZAUROW'S (372) patient was totally blind, and had undergone glaucomatous degeneration. In the left eye hypermature cataract, hard nucleus, liquid cortex. Operation—Graefe's linear section; easy expulsion of the lens within the capsule; no accidents during the operation. Patient counts fingers. Hygroscopic cotton soaked in a four-per-cent. solution of boracic acid placed on the eye. Two minutes later pain in the eye. Large hernia of vitreous when the eye was opened, soon followed by profuse hemorrhage, which lasted for several days, in spite of bandage and cold applications. When the patient left the hospital the blood had been so far absorbed that the coloboma could be seen. Behind the iris, blood and fibrous tissue; complete occlusion of pupil probable. HIRSCHMANN.

v. DUYSE (367) reports an interesting case of panophthalmitis after cataract-extraction. The operation was performed August 15, 1883; a cystoid scar developed with incarceration of the iris (cyst the size of a pin-head); V = $\frac{20}{30}$. As the eye did not remain irritable long, the patient soon attended to his work again. On March 9, 1884, the patient, who the day before had been at work as usual, appeared with a yellowish-brown infiltration of the cornea in the neighborhood of the iris-hernia, turbid aqueous, hypopyon, exudation in the pupil, only quantitative perception of light. Ciliary region painful to touch; chemosis and moderate œdema of the edges of the lids. Forty-eight hours later total panophthalmitis. Duyse quotes the literature of similar cases of panophthalmitis developing late after the operation.

MARCKWORT.

In KAZAUROW's (373) case erythropsia began two months after the extraction, as the result of a long walk on a winter's day, lasted a month, extended over the whole visual field, and was most perceptible at night, so that the patient mistook white for red, or pink and green for gray ; it was also very marked in moonlight. The author recommends rest and perhaps the use of blue or gray glasses to dispel it more quickly. He thinks it occurs much more frequently than is generally assumed, as the patients do not mention it (he discovered two more cases by questioning).

HIRSCHMANN.

PFLÜGER (379) adds four cases of erythropsia to the thirteen already published, two of which still possessed their lenses, one of them having artificial mydriasis on account of iritis, the cause being long-continued exposure to strong light. Hyperæsthesia (Benson) of the retina is probably the cause rather than anæsthesia (Hirschler, Purtscher).

XVII.—VITREOUS.

381. MULES. Steel chip removed from vitreous by the electromagnet. *Ophth. Rev.*, 1884, p. 361.

382. RAMPOLDI. Un caso notevole di sinchisi scintillante del vitreo. *Ann. di. ottalm.*, vol. xiii., 2.

RAMPOLDI's (382) cases of synchisis scintillans showed no other changes than moderate atrophy of the pigment, and hemeralopia. The latter yielded to tonic treatment. DANTONE.

MULES (381) reports the successful removal of a chip of steel from the vitreous, where it could be seen distinctly with the ophthalmoscope. The incision was made in the sclera through the tendon of the inferior rectus. FITZGERALD.

XVIII.—RETINA, AND FUNCTIONAL DISTURBANCES.

383. BERRY, GEO. A. Temporal hemianopsia. *Ophth. Rev.*, June, 1884, p. 165.

384. BERRY, GEO. A. Tobacco-amblyopia in women. *Ophth. Rev.*, 1884, p. 101.

385. EWETZKY, TH. An anomaly of the retinal venous pulse hitherto not described. *C. f. A.*, vol. viii., p. 167.

386. FORMIGGINI. Sopra un caso di ambliopia saturnina. *Riv. clin.*, No. 6, June, 1884.

387. FORTUNATI. Contributio alla cura dei distacchi retinici. *Gazz. d'ospit.*, Nos. 47 and 49, June, 1884.

388. GUAITA. Anatomie et physiologie pathologique de la rétinite pigmentaire. *Rec. d'ophth.*, June and July, 1884.

389. HIRSCHBERG, J. Amaurosis due to retinitis albuminurica. *C. f. A.*, vol. viii., p. 244.

390. LAKER, CARL. Another case of affection of the eye from a stroke of lightning. *Arch. f. Augenhk.*, vol xiv., 2, p. 161.

391. LUBRECHT, R. (Hamburg). Contribution to encephalopathia saturnina c. amaurosi. *Berl. klin. Wochenschr.*, No. 24, 1884.

392. MORTON. Central amblyopia in a smoker suffering from diabetes. *Ophth. Rev.*, 1884, p. 159.

393. NETTLESHIP and EDMUNDS. Central amblyopia in diabetes, and its dependence on or independence of tobacco-smoking. *Ophth. Rev.*, 1884, p. 165.

394. PANAS. De l'amblyopie toxique. *Union méd.*, p. 657, No. 35, Aug., 1884.

395. SCHMIDT-RIMPLER. Commotio retinæ. Perception of light diminished. *Zeh. klin. Monatsbl.*, vol. xxii., p. 212.

396. SHEARS, CH. Tobacco-amblyopia. *Brit. Med. Journ.*, June 14th, p. 1201.

397. SMITH, PRIESTLEY. Reflex amblyopia. *Ophth. Rev.*, May, p. 129.

398. SWANZY. Hemiachromatopsia. *Ophth. Rev.*, 1884, p. 185.

399. WALTER, ERNST. Clinical studies on detachment of the retina (Prof. Horner's clinic). *Inaug. Diss.*, Zürich, 1884.

EWETZKY (385) observed in two persons an anomaly of the venous pulse of the retina hitherto not described—its transmission to a considerable distance beyond the edge of the disc. The phenomenon disappeared in one case after a few weeks; in the other it was still slightly perceptible. No organic lesions.

GUAITA (388) gives an anatomical description of an eye affected with retinitis pigmentosa. The hyperplasia of the supporting tissue of the retina, though scarcely perceptible, was especially worthy of note. The essential feature of the disease is a chronic inflammation of the adventitia of the retinal blood-vessels.

MARCKWORT.

WALTER (399) reports on 300 cases of detachment of the retina from the clinic of Prof. Horner, with special regard to the etiology of the disease. Only the cases examined with the ophthalmoscope and the uncomplicated ones were considered. In 141 there were more or less marked opacities of the vitreous ; in 92 the detachment was below, in 6 in the region of the macula, and in only 2 at the inner side. The disease began suddenly in 52, and slowly in 57 cases. It occurred between the ages of twenty and thirty in 48 cases, between fifty and sixty in 84, between sixty and seventy in 54, and only once in the first decade. Between the ages of twenty and thirty, injuries are generally the cause ; later, senile changes in the blood-vessels. The etiology of 144 cases = 48 %, could be ascribed to myopia, especially at more advanced age ; of 49 cases, = 16.3 %, to injuries ; while the detachment was idiopathic in 28 cases, = 9.3 % ; the remaining 79 cases were mostly due to inflammatory processes in the uveal tract. Hemorrhages, therefore, play an important part in the etiology of detachment.

FORTUNATI (387) describes a case of detachment of the retina cured by puncture. After the first puncture with Pravasz syringe, the subretinal exudation escaped into the subconjunctival tissue, but was reproduced in a few days. A second puncture of the sclera with a lance-shaped knife was more successful, as four months later there was no relapse. DANTONE.

HIRSCHBERG (389) reports briefly a rare case of amaurosis due to retinitis albuminurica, observed in a young, cachectic individual, with detachment of the retina in both eyes.

BERRY (383) records two cases. In the first the typical blindness on the temporal side of the field of vision was slowly developed, remained for a considerable time unaltered, and then proceeded to more complete blindness. The second case was that of a woman aged thirty-two, who had for six months been suffering from headaches, constipation, giddiness, and flushing of the head. Menstruation had ceased at the age of 23, and there were no children. O. S., V almost nil ; O. D., $\frac{20}{100}$. When next seen the field of vision in each eye was taken, and exhibited well-marked hemianopsia in temporal portion. V in o. u. had improved. At a subsequent visit there was a further improvement of V, though the fields of vision were about the same. The patient's aspect was better, and the headaches, etc., had disappeared. FITZGERALD.

SWANZY (398) describes a case of hemiachromatopsia. A clergy-

man, aged seventy-seven, on rising from bed was attacked with slight vertigo and got to bed again, when he became unconscious and remained so until evening. In four days he quite recovered with some defect of vision and confusion of ideas on making any unwonted effort. Five months later Swanzy found well-marked hemiachromatopsia (left side of visual field), with contraction of color-field on other side. FITZGERALD.

SCHMIDT-RIMPLER (395) describes a case of commotion of the retina produced by a stone striking the eye, in which V was reduced to $\frac{4}{15}$, and a grayish-white discoloration of the fundus around the papilla and macula lutea was visible. Perception of light was very much reduced, a fact to which Schmidt-Rimpler calls special attention, and there was no astigmatism (in opposition to Berlin's view). Recovery after ten days.

PRIESTLEY SMITH (397) brings forward several arguments, anatomical, physiological, and clinical, in favor of the following propositions: 1. That concentric contraction of the field of vision in man is, in all cases, a sign of loss of function in the retina. 2. That hysterical amblyopia, neurasthenic asthenopia, and sympathetic amblyopia are conditions of peripheral anæsthesia, due to reflex contraction of the vessels which nourish the retina.

FITZGERALD.

LAKER (390) describes a case of affection of the eye produced by a stroke of lightning, the patient being totally blind for seven days and then rapidly recovering; there was no severe general paralysis besides. The ophthalmoscope showed neurotinitis and hemorrhages, followed by atrophic degeneration of the macula lutea and slight opacity of the cortex. The papillæ were grayish. Hyperæmia and hyperæsthesia of the conjunctiva persisted still longer. Perception of light was reduced, but not to an equal extent, in both eyes.

After careful observation for the past five or six years, BERRY (384) has met with only three cases of this form of amblyopia in women, and this fact he regards as strong evidence that tobacco is the primary element in the causation of the amblyopia. He finds (1) that alcohol has no direct influence in the causation of the amblyopia; (2) that smoking, at a time when the counter-stimulus of food is absent, more commonly tends to produce it than at other times; (3) that the outbreak is most likely to occur if, along with the want of food, the system, for the time being, is lowered by nervous exhaustion or imperfect nutrition; (4) that the disease is essentially functional. FITZGERALD.

MORTON (392) saw central amblyopia in a smoker suffering from diabetes, Lang and Lawford also, in a man subsequently affected with this disease, while NETTLESHIP and EDMUNDS (393) observed this coincidence in four cases. In all of them there was a central scotoma for red and green of the same extent in both eyes, which extended beyond the point of fixation. V decreased for a month and then became stationary. FITZGERALD.

SHEARS (396) gives in a tabular form the notes of forty cases of tobacco-amblyopia, from which he concludes: (1) That atrophy or the optic nerves is very rarely met with as the result of excessive smoking; (2) that tobacco is the essential agent in producing the failure of sight; (3) that great moderation in smoking, and especially the employment of the mild forms of tobacco, is all that is necessary to ensure recovery. FITZGERALD.

FORMIGGINI (386) thinks he has observed the first case of lead-amblyopia in Italy. The patient, a man aged thirty, had had three severe attacks of lead colic in sixteen years; during a fourth attack his sight became very poor, so that he could not walk alone. After four days V began to improve, but the field of vision was concentrically contracted; V in right eye $\frac{14}{20}$, in left $\frac{14}{60}$. The ophthalmoscope showed marked neuroretinitis in both eyes. The papillæ became normal again in appearance after injections of pilocarpine, the use of morphine and derivative medicines, and central V improved to $\frac{8}{10}$; the field of vision, however, enlarged only slightly. DANTONE.

LUBRECHT (391) describes a case of lead-intoxication with subsequent amaurosis. It developed three months after the first attack of colic, and was preceded by marked encephalopathia. The ophthalmoscope revealed pallor of the left papilla and indistinct outlines of the right. Efforts at accommodation and convergence did not affect the pupil. After three injections of strychnine the pupils again responded readily and V rose to $\frac{8}{5}$, No. 2. Red-green blindness had previously existed.

XIX.—OPTIC NERVE.

400. BOUVIN, M. J. (Hague). Neuritis optica ten gevolge vaan tumor cerebri. *Weekblad*, 1884, p. 45. *Zeh. klin. Monatsbl.*, vol. xxii., p. 133.

401. HIRSCHBERG, J. Neuritis retrobulbaris. *C. f. A.*, vol. viii., p. 185.

402. HOCK (Vienna). New cases of neuritis retrobulbaris peripherica (acuta et subacuta). *C. f. A.*, vol. viii., p. 107.

403. LANDESBERG, M. Cases of neuritis retrobulbaris peripherica acuta in both eyes. *C. f. A.*, vol. viii., p. 280.

404. REMAK, B. Case of coloboma of the optic nerve. *C. f. A.*, vol. viii., p. 225.

405. STOOD. Three cases of amaurosis in deformity of the skull. *Zeh. klin. Monatsbl.*, vol. xxii., pp. 248 and 337.

406. STOOD, A. Cases of malformation of the optic disc. *Zeh, klin. Monatsbl.*, vol. xxii., p. 285.

407. STORY, J. S. Optic neuritis. *British Med. Journ.*, June 14, p. 1153.

408. VOSSIUS. Case of atrophy of the optic nerve with a peculiar anomaly of the veins on the papilla in both eyes, and congenital deformity of the skull. *Zeh. klin. Monatsbl.*, vol. xxii., p. 172.

HOCK (402) defines more accurately the affection called by him neuritis retrobulbaris peripherica (acuta et subacuta), the main symptoms of which are painful sensations around the orbit and pain in movements of the eye; he judges from the direction in which movement is most painful or painful alone in what part of the visual field the function of the affected nerve-fibres has been changed or lost. He reports three cases.

HIRSCHBERG (401) also reports a case of neuritis retrobulbaris, six years under observation, in a girl aged seventeen, with $V = \frac{1}{\infty}$ and no reaction of the pupil of the left eye to light. Complete recovery in a month. Six years later the same condition in the right eye, attended with pain on rolling the eye upward and inward. Corresponding defect in the visual field for light and color. Complete recovery.

LANDESBERG (403) observed a case of neuritis retrobulbaris acuta of both eyes in a girl; in the right eye first, with rapid development of amaurosis and the ophthalmoscopic picture of neuroretinitis. Six months later the same condition in the left eye also after a cold. In the left eye the affection was not checked until after the application of a seton in the neck. Nothing is said in regard to the right eye, except that the optic neuritis persisted.

STOOD (406) observed a partial excavation of a small part of the papilla (about 2.44 *mm.* in depth), the bottom of which was traversed by two small blood-vessels, the fundus and V being otherwise normal. There was, however, a paracentral scotoma in

the visual field between the point of fixation and yellow spot. In another case he saw in both papillæ an extensive, deep, physiological excavation, extending to the margin on the temporal side, 3.35 and 2.72 *mm.* deep resp., so that the nerve-fibres were compressed into a narrow, crescentic space. In the right there was also a coloboma of the choroid; in the left slight atrophy of the pigment at the macula lutea. Field of vision normal. Epicritical remarks.

Remak (404) gives an accurate description of a case of coloboma of the optic nerve, which was limited in the right eye to the optic nerve with V normal. Concentric limitation of the field of vision. It can develop in three ways, judging from the thirteen cases thus far published, four of them by the Reviewer.

Bouvin (400) reports a case of neuro-retinitis exsud. e causa cerebrali, in which the autopsy revealed: isolated tubercles in the right ventricle, tuberculosis of the choroidal plexus, hydrocephalus internus, chronic basilar meningitis.

Story (407) reports a case of optic neuritis in a woman aged thirty-two, who had suffered from intense pain in the head; after some time she became unconscious, and when she regained consciousness she found that she had lost the sense of sight and smell. There was also a defect of taste in the anterior portion of the tongue at the right side, and sensation was absent from the right side of the face. Fitzgerald.

Stood (405) reports three cases of amaurosis in malformation of the skull, one of which, a dolichocephalus, with grayish-white discoloration of both optic nerves, at first had no perception of light, but later seemed to have a little. The second child and the third person were rather brachy-microcephali, with very slight development of the occiput. The pupils reacted; no ophthalmoscopic changes; there probably had been meningitis. In the third case the cerebral functions were normal.

In the case of Vossius (408) of atrophy of the optic nerve it was neuritic in both eyes, which had caused total amaurosis in the right and amblyopia of a high degree in the left eye. It was in causal connection with a malformation of the skull (a kind of dolichocephalus) and secondary degeneration of the optic nerve. The ten cases thus far reported are briefly mentioned. There was also a conglomeration of veins on the lower half of the papilla resembling a glomerulus, the development of which probably was connected with the embryonic blood-vessels of the fetal fissure.

XX.—INJURIES, FOREIGN BODIES (PARASITES).

409. BOURSIER. Blessure par des éclats de plomb fondu projetés dans les yeux. *Journ. d'ocul.*, No. 133, p. 146, Mar., 1884.

410. DUJARDIN. Trois blessures avec corps étrangers de l'œil ou de ses annexes. *Journ. des sci. méd. de Lille*, p. 201, Mar., 1884.

411. FERRIER. Projection de plombe fondu à la surface de l'œil sans brulure de l'organe. *Journ. d'ocul.*, No. 137, p. 185, July, 1884.

412. FRANKE, E. On foreign bodies in the anterior chamber and iris. *v. Graefe's Arch. f. Ophth.*, vol. xxx., 1, p. 211.

413. HIRSCHBERG, J. On division and concussion of the optic nerve. *C. f. A.*, vol. viii., p. 212.

414. LEBER, TH. Observations on the action of a chip of metal which had entered the eye. *v. Graefe's Arch. f. Ophth.*, vol. xxx., 1, p. 243.

415. OGIER. De l'iris au point de vue méd. légal. *Thèse de Lyon*, 1884.

FERRIER (411) removed three pieces of lead weighing twelve, forty, and forty-five *mg.* respectively, from the eyes of a young man who twelve days previously had been struck upon them with molten lead; they had adapted themselves to the shape of the eye. From this Ferrier concludes that the metal struck the eye while still liquid, and explains the absence of combustion by the well-known fact that the moistened hand can be dipped into molten iron without injury. A quantity of tears sufficient to prevent any further combustion would be formed before the lead solidified and cooled off.

v. MITTELSTÄDT.

BOURSIER'S (409) case closely resembles that of Ferrier, and the absence of combustion is explained in the same way.

v. MITTELSTÄDT.

In DUJARDIN'S (410) first case a chip of iron three sq. *mm.* in extent perforated the upper lid, so that it projected on the other side; healing of the severe corneal wound after extraction of the chip. In another case a chip of steel one *cm.* long and five *mm.* broad was removed from the orbit of a smith after remaining in for two years. It was not discovered until the eyeball, having become glaucomatous, was enucleated on account of severe pain.

v. MITTELSTÄDT.

After reporting the case of extraction of a bit of stone from the

iris, FRANKE (412) has prepared a very careful bibliography of the cases of foreign bodies in the anterior chamber, 56, and in the iris, 69. Of the former 36 were chips of iron, in 6 of which no purulent inflammation was observed, in 1 it occurred after two weeks together with iritis and cyclitis, while in the iris they were observed in 30 cases, most of them encysted. In 2 enucleation became necessary, in 18 they were extracted with good results. In 9 cases chips of copper were found in the anterior chamber, and in 19 in the iris ; 5 were extracted, once enucleation was performed. In 8 cases the foreign body on the iris was enveloped in an exudation, in 7 of which there was severe inflammation. In 10 cases bits of stone were observed in the anterior chamber, in 7 in the iris, in 5 of which there was severe inflammation. 21 cases of eyelashes, numbering from 1 to 14, are reported, in one of which no evil consequences had followed after 10 years. In the majority of cases cysts developed in the iris. Splinters of wood and thorns were observed in 6 cases, glass and porcelain in 3 in the anterior chamber ; in 1 on the iris. Eyelashes and splinters of glass rarely produced reaction, while with chips of metal the reverse is true, corresponding with the results of Leber's well-known experiments. The chemical action is the more injurious. Although the foreign body may be encysted, this is no guaranty against inflammation, 14 out of 16 encysted foreign bodies giving rise to inflammation later, and necessitating extraction or enucleation respectively in 12 of these. The prognosis for the preservation of the shape of the globe and vision is generally not good ; the foreign body should always be extracted as soon as possible.

LEBER (414) discusses the action of chips of metal which have penetrated into the eye, basing his conclusions on experiments with animals, and compares the symptoms, course, etc., with those of six accurately observed cases of injury in human beings. Leber describes the symptoms following the introduction of asceptic particles of iron and copper in solid or powdered form into the anterior chamber, and concludes that foreign bodies, consisting of oxydizable metal, can themselves produce inflammation, but need not do so always, as the action depends not only on the kind of metal, but also on the position of the foreign body in reference to the vascular parts of the eye. The observations of total absorption of powdered copper and iron introduced into the anterior chamber are of special interest.

HIRSCHBERG (413) briefly reports two cases of injury to the op-

tic nerve, consisting in one in total division from the thrust of a rapier, and accompanied by very slight external symptoms, in the other in contusion in the supraciliary region, received during a severe epileptic attack; in the former total amaurosis resulted with atrophy of the optic nerve; in the latter a relative central scotoma developed with discoloration of the temporal half of the papilla.

OGIER (415) describes the injuries of the iris and their results, and reports thirty-one cases observed at Gayet's clinic, from 1878 to 1880, which are particularly important to the medico-legal officer on account of their prognosis. v. MITTELSTÄDT.

XXI.—OCULAR AFFECTIONS IN CONSTITUTIONAL DISEASES.

416. BENSON. Paralysis of some of the ocular muscles, etc., after diphtheria, with remarks on the pathology of the affection. *Ophth. Rev.*, p. 265.

417. BOUCHUT. Etudes d'ophthalmoscopie dans la méningite et dans les maladies cérébrospinales. *Thèse de Paris*, May, 1884.

418. BRUNET. (Tourcoing). Nephrite parenchymateuse avec œdème prédominante à droite et rétinite du même côté. *Journ. des sci. méd. de Lille*, 1884, No. 9, p. 313.

419. CHARPENTIER, AUG. Etude d'un cas d'héméralopie dans le cours d'une cirrhose hypertrophique. *Arch. d'ophth.*, vol. iv., No. 4, p. 370, July–Aug., 1884.

420. DENISSENKO. Ophthalmia albuminurica et œdematosa, Moscow, 1880, p. 26.

421. EDMUNDS and LAWFORD. Optic neuritis in intra-cranial diseases. *Trans. Ophth. Soc. Unit. Kingd.*, vol. iii., p. 138.

422. EPERON. Hémiachromatopsie absolue, avec conservation partielle de la perception lumineuse et de l'acuité visuelle indirecte, dyslexie. Quelgues considérations relatives à la localisations des centres visuels corticaux et aux phénomènes mentaux de la lecture. *Arch. d'ophth.*, vol. iv., 4, p. 356, July–Aug., 1884.

423. FÉRÉ. Traitement de la migraine ophthalmique. *Progr. méd.*, No. 23., p. 454, June, 1884.

424. FITZGERALD. Diseases of the eye and affections of the genital organs in females. *Ophth. Rev.*, 1882, p. 179.

425. GALEZOWSKI. Des troubles oculaires dans l'ataxie locomotrice, paralysie des nerf moteurs de l'œil. Leçons receuillies par Despagnet. *Gaz. des hôp.*, pp. 475, 491, Nos. 60 and 62, March, 1884.

426. GALEZOWSKI. De l'atrophie de la papille ataxique. *Rev. d'ophth.*, May, 1884.

427. GOWERS. Eye symptoms in diseases of the spinal cord. *Discussion of the Ophth. Soc. of the Unit. Kingd.*, 1884, p. 190.

428. JACKSON, HUGHLINS. A case of ocular movements, with vertigo, produced by pressure on a diseased ear. *Ophth. Rev.*, p. 261.

429. JALON. Atrophie du nerf optique consécutive à des oreillons. *Arch. de méd. militaire*, 1883, vol. i., p. 109.

430. LUTZ. Ocular affection during pregnancy and in the puerperal condition. *Mitth. aus d. Tübingen Univ. klin.* von Prof. Nagel, vol. ii., p. 1, 1884.

431. MOORE, A. Influence of the skin and its diseases upon the eye. Wiesbaden, J. F. Bergmann, 1884.

432. MUSSO. Sulle variazioni del diametro pupillare negli epilettici. *Boll. d'ocul.*, vol. vi., No. 8, Apr., 1884.

433. NAGEL. Contribution to the knowledge of the post-diphtheritic ocular affections. *Mitth. aus d. Univ. klin. zu Tübingen*, von Prof. Nagel, vol. ii., p. 1, 1884.

434. NIEDEN, A. Case of affection of the sympathetic nerve in the region of the eye. *C. f. A.*, vol. viii., p. 153.

435. OLE BULL, M. O. The ophthalmoscope and lues. With six plates. Christiania, Malling, 1884.

436. PAGET, W. S. Condition of eye in hay fever. *Brit. Med. Jour.*, 1884, p. 1203.

437. PANAS. Manifestations des maladies générales sur l'appareil de la vision. Rhumatisme oculaire. Leçon faite à l'Hotel Dieu. *Union méd.*, No. 57, Apr. 20, 1884.

438. UHTHOFF. Case of ophthalmoplegia externa of both eyes after diphtheria of the throat. *Berl. Ges. f. Psych. and Nervenkrankh. Berl. klin. Wochenschr.*, No. 24, 1884.

439. WESTFALL, PROF. Case of general paralysis with spinal affection and blindness. *Neur. Centralbl.*, 1884, No. 15.

BOUCHUT (417) reports on the ophthalmoscopic appearance

in twenty-one new cases of meningitis and adds some chromolithographs. He believes that the disturbances of circulation in acute or tubercular meningitis extend also to the optic nerve and retina, and that the ophthalmoscope will show the hyperæmia and inflammation thus induced. v. MITTELSTÄDT.

EDMUNDS and LAWFORD (421) record twenty-two cases of head injuries and intracranial disease. Twenty-one of these proved fatal, and the post-mortem notes are given, and in twenty the notes of the microscopic examination of the optic nerves and discs. The object of the paper is to bring forward further evidence in favor of the opinion already expressed by Edmunds, that the connection between intracranial diseases and optic neuritis is to be found in an inflammation extending down the connective tissue and blood-vessels of the nerve, and that double optic neuritis with cerebral symptoms means meningitis about the base of the brain, which may be primary or secondary to a tumor or some other disease of the brain-substance itself. The results are summed up as follows: (1) Optic neuritis is present in all in which there was obvious meningitis; (2) In one case at the post-mortem no meningitis was noted, microscopic examination subsequently showed that the meninges were inflamed; (3) There was no case of optic neuritis in which the meninges at the base were shown by the microscope to be free from inflammation.

FITZGERALD.

EPERON'S (422) case was that of a man aged seventy, who awoke a year ago with right-sided hemiparesis, which disappeared again, with the exception of a sensation of slight numbness in the right arm. When the patient came on account of the dyslexia which had existed since then, he was found to be almost completely word-blind. His field of vision for white was normal, but in the right half he was totally unable to distinguish colors, which seemed gray; perception of light and eccentric vision were also here greatly reduced, so that he could not read even large type; the dyslexia is therefore a purely cerebral symptom. The other functions of the eyes are normal, also the fundus. He is sound in mind and body. After accurately describing the individual symptoms Eperon makes some remarks as to the probable seat of the affection, which probably is due to embolism or apoplexy, and on the relative position of the centres of color, light, and form. As they are in close proximity to the centres of sound and graphic images, the well-known cases of double perception (association of

sound with conceptions of form and color) become more intelligible. v. MITTELSTÄDT.

MUSSO (432) concludes from measurements of the diameter of the pupil in seventy epileptics (sixty men and ten women) and twenty healthy persons, that the pupils of the former do not show any noteworthy dilatation. The diameters of the two pupils are different in 22.8 per cent., more frequently in the psychic than in the classical form of epilepsy. Accurate observations of twenty patients made for a whole month before, during and after the attack, show that in one group of these patients the difference in width of the pupils precedes the attack, and disappears again when it is over. The frequent changes in the width of the pupils of some epileptics are not of such general occurrence as to be of true diagnostic importance. DANTONE.

NIEDEN (434) reports a case of affection of the sympathetic nerve, which began, after a rapid cooling off of the heated head, in the territory supplied by the supraorbital nerve, and manifested itself in contraction of the pupil and palpebral fissure, sinking back of the globe into the orbit, and total anhidrosis of the skin of the brow and lids. There was also a certain degree of hyperæsthesia. The temporal artery of the affected side showed distinctly vascular paralysis, as could easily be shown by the curves, the first of this kind published. The patient gradually improved in the course of a few months.

WESTFAL'S (439) case of general paralysis, with spinal affection and amaurosis occurrred in a person whose V began to decrease two years after the first general symptoms, followed by discoloration of the disc, and two years later total blindness. The patellar reflex was always absent. A year and a half later, mania, and death in collapse. Gray degeneration of the posterior columns in the cervical and lumbar portions ; no disseminate alterations.

GALEZOWSKI (425 and 426) believes that paralysis of the ocular nerves frequently is the initial symptom of tabes, and recommends iodide of potass. (6–7 grm. daily), being a supporter of Fournier's theory as to the pathogeny of tabes. He also recommends subcutaneous injections of auro-potass. cyanat (0.2:10 aq., five drops at first, and increasing to fifteen) for the atrophy of the optic nerve accompanying the disease. At present he is experimenting with auro-potass. bromat. According to Galezowski, the central artery and vein may preserve a normal appearance and calibre in tabetic atrophy of the optic nerve when the atrophy is already

complete, as the optic nerve is nourished by capillaries coming from the meninges, and the central blood-vesssels are of only secondary importance in this respect. In opposition to Leber, according to whom the atrophy advances from the periphery of the transverse section of the optic nerve towards the centre, Galezowski asserts that this is not always the case, isolated, atrophic spots being found at times. He agrees with Fournier, in opposition to Charcot, in ascribing tabes in many cases to syphilis. MARCKWORT.

GOWERS (427), who opened the discussion at a special meeting of the Ophthalmological Society, considered there were two subjects to which especial attention should be directed, viz.: "Optic nerve atrophy" and "Internal ocular paralysis." He observes that it is strange that although degenerations of the spinal cord are so numerous, it is only with one, namely, locomotor ataxy, that eye-symptoms are chiefly associated. As to the proportion of cases of tabes in which optic atrophy occurs, G., by his statistics, found it equal to 20 %, but he concluded this was due to accidental circumstances, and that the estimate he gave some years ago, namely, 15 %, was nearer the truth. In his experience atrophy occurs more frequently in the early period of the disease. Like atrophy, paralysis of the internal muscles is more frequent in ataxy than in other spinal diseases. The Argyll-Robertson phenomenon is the most frequent. Observations show that these paralyses generally occur in the early stages of the disease, and that those cases which escape in the early stages are sure to be attacked later. Erb's statement, that loss of the reflex dilatation of the pupil on stimulation of the skin is usually associated with loss of the light reflex, though true as regards a number of cases, is not true of all. G. has seen several in which there was no contraction to light, but well-marked dilatation on stimulation of the skin. He has not met with this affection of the intra-ocular muscles in any other disease limited to the spinal cord. Lewis communicated a paper on ocular symptoms occurring in general paralysis of the insane, from an exhaustive examination of sixty cases. Impairment of reflex dilatation of pupil to cutaneous stimulation he found to be the most frequent anomaly (63 %). A large proportion (28 %) exhibited the singular phenomenon of an active initial contraction of the pupil during focal illumination, and subsequently a dilation to its full extent under sustained illumination. In the discussion which followed, numer-

ous cases of optic neuritis ending in atrophy were reported. Gunn believes that optic neuritis does not always lead to blindness, that there may be temporary arrest, and even slight improvement. Nettleship shared the belief of Gowers, that the optic nerve lesion in spinal diseases is probably not continuous with the changes in the cord. Out of a total of 76 cases of optic atrophy, he found 38 had undoubted locomotor ataxy, and 20 others were suffering from some other form of chronic spinal disease, or from mixed cerebral and spinal symptoms. N. believes that in locomotor ataxy the atrophy almost always begins in one eye before the other. (*Ibid.*, p. 190.)

BRUNET (418) reports a case of parenchymatous nephritis, in which the œdema was confined almost exclusively to the right side of the body, and the right eye showed albuminuric retinitis. This case is similar to some published by Potain (*Gaz. des hôp.*, Feb. 17, 1883), and another published by Yvert (*Rev. d'ophth.*, March, 1883). In Potain's cases a unilateral œdema developed in the lumbar region after contusion, which was ascribed to one-sided sympathetic inflammation, produced by an affection of the kidney of the same side. Yvert found in his case only one kidney when he made the autopsy, which belonged to the œdematous side of the body. v. MITTELSTÄDT.

OLE BULL'S (435) paper on the ophthalmoscopic manifestations of lues as primary symptoms in the fundus, deserves attentive reading. Illustrated.

BENSON (416) considers that the results of modern research seem to point to the great nervous centres as the seat of the lesion which produces the paralytic sequelæ of diphtheria. As regards the nature of the lesion, he appears to favor the view that it is the occurrence of small hemorrhages. FITZGERALD.

NAGEL (433) observed slight optic neuritis, with grayish turbidity of the retina around the papilla, and hyperæmia of the blood-vessels following diphtheria of the pharynx. Function was only slightly impaired; recovery always complete. Probably the optic nerve had been invaded by micro-organisms.

UHTHOFF (438) presented a boy aged ten, in whose right eye total ophthalmoplegia of all the muscles developed, with paralysis of the soft palate, and of accommodation four weeks after diphtheria of the pharynx, while in the left only the external rectus retained slight mobility. Moderate degree of ptosis in both. Improvement after the lapse of twenty days; the power of ac-

commodation returned a few days earlier. The patellar reflex was absent from the beginning, and the lower extremities were extremely weak; the upper, less so. The pupils reacted.

JALON (429) observed in a young soldier neuritic atrophy and amaurosis of the right eye, after mumps. The visual disturbance did not begin until after the primary affection had run its course. v. MITTELSTÄDT.

PAGET (436) attaches great importance to the protection of the eyes in the treatment of hay fever. Conjunctival irritation he finds as a rule precedes by some days the nasal irritation, and consequently the wearing of goggles or a veil is of advantage, not only as a method of shielding off the pollen, dust, and wind, but also as a protection from the glare and heat. FITZGERALD.

PANAS (437) places keratitis profunda among the rheumatic affections of the eye, and also attributes a muco-purulent conjunctivitis to the same cause. He has, however, never observed in rheumatism the purulent conjunctivitis described by Perrin, which rapidly runs its course. v. MITTELSTÄDT.

CHARPENTIER (419) examined with his photoptometer, described in the *Arch. d'ophth.*, vol. iv., No. 3, p. 210, the perceptivity of light of a man aged twenty-two, with hemeralopia in hypertrophic cirrhosis of the liver. He found it reduced to $\frac{1}{30}$ to $\frac{1}{60}$ of the normal. Contrary, however, to the behavior of the normal eye, whose perceptivity of light increases in the dark, that of the hemeralope decreased considerably. It is worthy of note also that the hemeralopia preceded the affection of the liver, and was followed by icterus, lasting through the whole course of the disease, which terminated fatally after twenty months. V, field of vision, and color sense were normal. The fundus was very pale; the edges of the disc in the left eye slightly blurred.

v. MITTELSTÄDT.

FITZGERALD (424) discusses the disturbances of vision attending affections of the genital organs in women, and calls attention to the consequences of masturbation in females. Lutz assumes for the occurrence of ocular affections during pregnancy causes which must be sought in the change of circulation and nutrition due to pregnancy, especially in the changed composition of the blood, and in the complications usually occurring during gravidity and in the puerperal state. As such he mentions (1) albuminuria, where retinitis albuminurica has been observed in every month of pregnancy. With the disappearance of the albuminuria after the

puerperium, the retinitis also vanishes. The frequent occurrence of detachment of the retina probably stands in connection with the general tendency to œdema: recovery is generally complete. (2) Icterus, the result of catarrh or acute yellow inflammation of the liver, with amblyopia, and even amaurosis. (3) Embolic processes in puerperal fever, with or without endocarditis. (4) Profuse hemorrhages, frequently followed by amaurosis and atrophy of the optic nerve; recovery rare. Temporary disturbances of vision, such as amblyopia, central scintillating scotomata, hemianopsia, hemeralopia, and achromatopsia are the result of anæmia or hyperæmia of the brain, though they can also be ascribed to reflex action from the uterus. Pregnancy probably produces also a tendency to hemorrhages into retina and vitreous.

MOOREN (431) endeavors to present in a systematic manner the influence of the skin, both physiological and pathological, as a cause of visual disturbances, an endeavor in which the large material at his command is of great service.

FÉRÉ (423) observed after bromide of potash a diminution of the attacks in those cases of ophthalmic megrim, which were accompanied by aphasia, monoplegia, hemiplegia, and partial epilepsy, but only when material central lesions were improbable.

v. MITTELSTÄDT.

SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY DURING THE FOURTH QUARTER OF THE YEAR 1884.

By H. MAGNUS, Breslau; C. HORSTMANN, Berlin; and A. NIEDEN, Bochum.

WITH THE COÖPERATION OF

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I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

By H. MAGNUS, M.D.

a.—TEXT-BOOKS, MONOGRAPHS, TREATISES ON GENERAL, BIBLIOGRAPHICAL, AND HISTORICAL SUBJECTS.

440. Berthold. Phlegmon de l'œil. Enucléation du globe chez une femme enceinte de sept mois. *Gaz. méd. de Paris*, p. 448.

441. de Candolle. Hérédité de la couleur des yeux dans l'espèce humaine. *Arch. des sci. phys. et natur.*, Genève, Aug., 1884.

442. Dujardin. L'examen ophthalmoscopique chez les tout jeunes enfants. *Jour. des sci. méd. de Lille*, 1884, No. 15. Uses a slight chloroform-narcosis for examining little children with the ophthalmoscope.

443. Haltenhoff. Courte notice historique sur Jacques Daviel. *Rev. méd. de la Suisse rom.*, 1884, No. 10. Communication on Daviel's grave.

444. KOTELMANN. The eyes of 23 Singhalese and 3 Hindoos. *Zeitschr. f. Ethnol.*, 1884.

445. REICHARD. Air, light, and sound, and their relation to school hygiene. Riga, 1884, Kymmel.

446. SCHUBERT. The present stage of the discussion of the proper position in writing.

447. WARLOMONT. De l'empirisme en ophthalmologie. *Ann. d' ocul.*, vol. xcii., p. 285.

BERTHOLD (440) observed very painful contractions of the uterus while enucleating the eye of a pregnant woman without narcosis.

DE CANDOLLE (441) considers transmission of the color of the eyes the rule. Among 578 observations of brown, blue and grayish-blue eyes, this fact was noted in 88.4-per-cent. In 11.6-per-cent. it was absent, but was found again in the grandparents, as far as investigations could establish this. When the color of the father's eyes differs from that of the mother's, the brown is generally transmitted, so that this color becomes more common from generation to generation, as has been shown statistically also for the color of the hair. V. MITTELSTÄDT.

Of 46 eyes of Singhalese KOTELMANN (444) found 58.7-per-cent. hypermetropic, 41.3-per-cent. emmetropic and none myopic. Although a comparatively large number of Singhalese can read and write, not one was myopic. There was no color blindness. The hair was always black, the iris brown.

SCHUBERT (446) considers the position of the book to the right in writing equally injurious to the eye and spine, but highly recommends the straight median position. He criticises particularly Berlin-Rembold's views; a discussion of this criticism however would lead too far.

b.—STATISTICAL PAPERS.

448. CHODIN. Short report on the ophthalmic clinic of the University of St. Wladimir, at Kiew, for the twelve years of its existence, from 1870 to 1883. *Wjestnik Ophth.*, Oct., 1884.

449. INOUYE. Private ophthalmic clinic. Report for the year 1884. Tokio, 1885. An appeal is added to the oculists of Europe for assistance and advice. 3,671 patients were treated; 9 extractions; 100 iridectomies.

450. JANY. Twentieth annual report on Dr. Jany's ophthalmic clinic. Breslau, 1884.

451. MARLOW. Statistical report of the ophthalmic department for the year 1883. *St. Thomas Hosp. Rep.*, vol. xiii.

452. PFLÜGER. Opthalmic clinic of the University of Berne. Report for 1883. Berne, 1885.

453. RAMPOLDI. La clinica oculistica di Pavia per gli anni scolastici 1882–83 et 1883–84. *Rendiconte Ann. di ottalm.*, vol. xiii., 5, 6.

454. REICH. Statistics of the blind of Russia. *Centralbl. f. pract. Augenhk.*, Oct., 1884.

455. STEFFAN. Twenty-second annual report of the ophthalmic Institute at Frankfort-on-the-Main. 1884.

The number of patients treated from 1870–76 under the direction of Prof. Iwanoff, whose private patients are included, was 11,900 with 14,722 diseases; 787 indoor patients. On the latter 819 operations were performed, among them 474 extractions. From 1876 to 1880, under the direction of Prof. Mandelstamm, (whose private patients are not included,) 4,054 ambulatory with 4,576 diseases, and 456 indoor patients, upon whom 491 operations were performed, among them 236 extractions. 1881–82 under the direction of Prof Chodin, 1,669 ambulatory patients with 1,241 diseases, and 137 operations, 183 indoor patients, 181 operations, among them 70 extractions. HIRSCHMANN.

JANY (450) treated 4,116 patients and operated 72 senile cataracts according to v. Graefe; 3 moderate results, 6 failures. Ten senile cataracts were extracted within the capsule, of which 6 were good, 3 moderate results, and one a failure. On the iris, 90 operations were performed; 7 sclerotomies in glaucoma, 14 enucleations, 25 operations on the muscles.

At the ST. THOMAS HOSPITAL (451), 3,150 new patients were treated; 280 operations. 42 senile cataracts were extracted, exact statistics of which are added.

At BERNE (452), 961 eye-patients were treated in the dispensary; the largest number was treated in May, the smallest in October. 276 operations were performed. 77 uncomplicated senile cataracts were extracted, according to v. Graefe, with only one failure. 6 cataracts were extracted within the capsule with good results. The optic nerve was stretched in a case of tabes, but unsuccessfully. Reports of several cases are added, and a treatise on erythropsia.

In the clinic at PAVIA (453), 3,063 patients were treated from 1882 to 1884, 2,475 in the dispensary. 732 operations were performed, among them 137 extractions (6 losses). DANTONE.

REICH (454) observed in the dispensary at Tiflis, from 1879 to 1882, 3.7 per cent. of persons blind in both eyes among all the eye-cases, and in his private practice 1.5 per cent. Blennorrhœa neonatorum was the cause in 27 per cent. of all cases brought into the dispensary. Affections of the outer parts were the cause in 65 per cent., of the inner parts in 35 per cent. According to the official report for the district of Kiew there are only 6 blind among every 10,000 Jews, and 22 among every 10,000 Christians—a ratio which differs very much from that which has been found for Germany.

STEFFAN (455) treated 5,954 new patients, and performed 513 operations. 22 senile cataracts were operated, all with good result, except one, a failure.

II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPEUTICS.

a.—GENERAL PATHOLOGY AND DIAGNOSIS.

456. BAAS. General disturbances due to the wearing of cataract-glasses. *Klin. Monatsbl. f. Augenhk.*, Oct., 1884.

457. DUBOIS. Effets produits par l'anasthésie chloroformique prolongée sur les milieux réfringents de l'œil. *Soc. de biol.*, Jan., 1884 ; *Jour. d'ocul.*, June, 1884.

458. GRAHAMER. Contribution to the pathological anatomy of congenital hydrophthalmus. *Arch. f. Ophth.*, vol. xxx., 3.

459. HAAB. Further reports on tuberculosis of the eye. *Klin. Monatsbl. f. Augenhk.*, vol. xxii., p. 391.

460. MICHEL. Chemical composition of the lens-substance. Internat. med. Congress at Copenhagen. *Centralbl. f. prakt. Augenhk.*, Nov., 1884, p. 332.

BAAS (456) observed headache, dizziness, and choking sensations when cataract-glasses of different focus were worn in a reversible frame.

DUBOIS (457) saw the ophthalmoscopic image of the fundus become irregular and distorted in persons under the influence of chloroform, which, as shown by the keratoscope, is due to irregular corneal astigmatism, not produced, however, by irregularities on the surface, which disappeared again on the return of sensibility. The refraction was found to have been reduced 4–5 D in a narcotized dog after the disappearance of the reflex action of the pupil. V. MITTELSTÄDT.

GRAHAMER (458) cannot agree with Horner, Mauthner, and others in assuming every case of congenital hydrophthalmus to be one of congenital glaucoma. His investigations demonstrated the absence of inflammation and occlusion of the iris-angle, the test for the existence of glaucoma. He therefore believes that a uveitis or serous cyclitis respectively is the primary cause, to which all the other symptoms are secondary.

MICHEL (460) found three albuminous substances in the lens. When a senile cataract forms the albumen disappears, and only globulines are found.

b.—GENERAL THERAPEUTICS.

461. ABADIE. Des opérations qui se pratiquent dans un but esthétique sur les yeux perdus, difformes et douloureux. Leçon recueilli par M. Toupet. *Gaz. méd. de Paris*, 1884, No. 48.

462. BEAUDON. A propos de l'extraction au moyen de l'aimant des fragments de fer et d'acier dans l'œil. *Rev. clin. d'ocul.*, Aug., 1884.

463. MAGAWLY. On antiseptics in ophthalmology. *Petersb. med. Wochenschr.*, 1884, p. 200. The results are much better since the introduction of antiseptics.

464. MEYER. The artificial ripening of cataract. Internat. med. Cong. at Copenhagen. *Centralbl. f. prakt. Augenhk.*, Nov., 1884, p. 332.

465. SCHWEIGGER. Resection of the optic nerve. *Ber. über d. Heidelb. Ophth. Gesellsch.* Rostock, 1884.

ABADIE (461) recommends Critchett's operation only in children with hydrophthalmus, and Knapp-Wecker's method in young persons, provided there is no danger of sympathetic ophthalmia. He believes that exenteration of the globe as recommended by Graefe may be substituted for the enucleation which otherwise would become necessary; enucleation need therefore be done only when sympathetic ophthalmia has begun, and for tumors.

BEAUDON (462) considers the magnet insufficient for the removal of very small bodies from the interior of the eye, as its power of attraction is directly proportional to the mass of the foreign body. v. MITTELSTÄDT.

MEYER (464) highly recommends Förster's method of artificial ripening of cataract. Not only slowly ripening cataracts with

hard nucleus are suitable for this operation, but also soft cortical cataracts. The lens may become opaque either at once or gradually.

SCHWEIGGER (465) considers resection of the optic nerve as good a protection against sympathetic ophthalmia as enucleation, and therefore recommends it.

III.—INSTRUMENTS AND REMEDIES.

a.—INSTRUMENTS AND TECHNICAL CONTRIVANCES.

466. ALBERTOTTI. An autometric, self-registering perimeter. *Klin. Monatsbl. f. Augenhk.*, Dec., 1884, and *Ann. d'ocul.*, vol. xcii., p. 198.

467. ARMAIGNAC. Blépharostat à détente instantanée, se plaçant et s'enlevant avec une seule main. *Rev. clin. d'ocul.*, No. 11, p. 268.

468. BUCKLIN. A new polariscope for testing pebble lenses. *Amer. Jour. of Ophth.*, vol. i., No. 6.

469. CULBERTSON. Iriscystome. *Amer. Jour. of Ophth.*, Oct., 1884.

470. GRADENIGO. Occhiale elettrico. *Boll. d'ocul.*, vol. vii., Sept. 1, 1884.

471. KÖNIG. A new apparatus for diagnosticating color-blindness. *Centralbl. f. prakt. Augenhk.*, Dec., 1884.

472. NIEDEN. Leucoscope. *Ber. über d. deutsche ophth. Ges. zu Heidelberg*. Rostock, 1884.

473. SCHMIDT-RIMPLER. Refraction-ophthalmoscope. Internat. med. Congr. at Copenhagen. *Centralbl. f. prakt. Augenhk.*, Nov. 1884, p. 332.

ALBERTOTTI (466) describes a self-registering perimeter, with which the (presumably intelligent) patient can examine himself, but which will hardly be adopted by practical oculists. As the patient always knows from what side the object approaches, and what its color is, he can easily deceive himself. His visual charts differs materially, but not advantageously from the one in general use.

ARMAIGNAC (467) describes a speculum which was constructed by Mathieu eight years ago; it is very practical, and can be removed with one hand by compressing it. As early as 1872 a very

similar one was used in some clinics. Noyes demonstrated it in 1872 at Wiesbaden. MARCKWORT.

CULBERTSON'S (469) instrument is intended for cutting out a triangular bit of the iris or lens-capsule, and is specially adapted for secondary cataract and iritic adhesions. BURNETT.

GRADENIGO (470) has constructed an electric pair of spectacles by attaching to an ordinary pair two couples of small electro-motors of zinc and copper. One element is attached with springs to the outer end of the frame which press it against the temples, the second pair forms the covering of the bridge. Perspiration and the humidity of the atmosphere produce a weak electric current. DANTONE.

NIEDEN (472) recommends the ophthalmo-leucoscope constructed by Helmholtz and improved by König, for testing for color-blindness. It has the advantage that the colors of the spectrum can always be used, and that every patient can state at once with the greatest ease and accuracy what colors appear to him alike.

SCHMIDT-RIMPLER (473) explains his well-known refraction-ophthalmoscope (examination of the inverted image). It has the following advantages: 1. the examiner need neither know nor relax his accommodation; 2. the maximum of distinctness of the image can be determined with greater accuracy; 3. it is not necessary to approach closely to the patient; 4. the refractive condition of the macula lutea can be determined with special accuracy by this method.

b.—REMEDIES.

474. ALBINI. Considerazioni ed osservazioni pratiche sui colliri. *Atti di R. Accad. med. chir. di Napoli.*, 1884, No. 2.

475. BONO. De cloridrato di tebaina nella terapia di alcune affezioni del nervo ottico. *Gaz. de clin.*, vol. xx., p. 39.

476. LANGE. Antiseptics in cataract-extractions. *Klin. Monatsbl. f. Augenhk.*, Nov., 1884.

ALBINI (474) desires a more scientific classification of the collyria. His experiments to replace nitrate of silver with nitric acid (2–5) proved satisfactory to him. DANTONE.

BONO (475) has made comparative experiments on guinea-pigs with the alkaloids of opium, and obtained the following smallest doses for acute poisoning after subcutaneous injections: for every kilogr. of the animals the action is the same of 30 parts of

thebaine, 120 of codeine, 580 of morphine, 600 of narcotine, and 640 of papaverine. A 2½-per-cent. solution of thebaine dropped into the conjunctival sac has a powerful myotic action, which begins after half an hour and lasts 4½ hours. In other respects it acts similarly to strychnine. He used it with good results in alcohol- and tobacco-amblyopia, blinding of the retina, atrophy of the optic nerve as the result of general paralysis or exhausting disease, and neuro-retinitis. It failed in affections of the optic nerve due to syphilis. In collyria he used the 3-per-cent. solution; for subcutaneous injections, 0.001–3; internally in pills two to four times daily, 0.001. DANTONE.

IV.—ANATOMY.

a.—GENERAL ANATOMY.

477. EUSTACHE. Fœtus cyclope. *Jour. des sci. méd. de Lille.* July, 1884, No. 13.

478. HILBERT. The embryological changes of the refractive media and the fundus of the eye of the cat after birth. *Arch. f. Ophth.*, vol. xxx., 3.

479. POUCHET. Organes visuels des êtres unicellulaires. *Soc. de biol.*, meeting of Oct. 27, 1884. *Gaz. hebd. de méd. et de chir.*, 1884, p. 726.

480. SCHIESS-GEMUSEUS. Four cases of congenital anomalies of the eye. *Arch. f. Ophth.*, vol. xxx., 3.

481. VON SCHULTÉN. Experimental investigations on the circulation of the eye and on the connection between it and that of the brain. *Arch. f. Ophth.*, vol. xxx., 3. Results rather meagre.

EUSTACHE (477) describes a fœtus of eight months which was well developed in all its parts except the head. The eye was concealed under a club-shaped process, the rudimentary nose, which sprang from the middle of the forehead. The four lids, of which only the upper ones were united, form a rhomboidal cleft 1 *cm.* long and 5 *mm.* high. Meibom's glands and lashes were found, the latter only above. In the lower angle something resembling the caruncula. Of the lachrymal canals only the right was developed to the extent of 3 *mm.* The eyeball, embedded in a large mass of fatty tissue, had a conico-cylindrical shape, was flattened vertically, and had a circular furrow marking the line of union. There was no cornea; optic nerve very thick; some

muscles found, but they were abnormal in arrangement and direction. In the interior a partition dividing the eyeball into two unequal parts; on the right side there was a lens, on the left it was only indicated. The choroid covered the whole inner surface of the sclera. No anterior chamber. v. MITTELSTÄDT.

HILBERT (478) found that the eye of the young cat is not fully developed until two months after birth. The refractive media remain turbid for a long time after birth, and the tapetum, with its metallic lustre, does not begin until a month after birth. On the lens blood-vessels can be seen, which belong to the capsulo-papillary membrane, a remnant of the vascular covering of the lens at an early stage of development. There was no real pupillary membrane.

POUCHET (479) thinks that some granula lying behind the region of the mouth are the visual organs of some unicellular animals belonging to the group of peridynia. They are black dots of pigment on a hyaline mass resembling a pumpkin. They seem to guide the animal in its movements. P. Bert thinks these organs may be intended not for sight, but for illumination.

v. MITTELSTÄDT.

SCHIESS-GEMUSEUS (480) describes cases of anophthalmus, coloboma oculi, hydrophthalmus with keratoglobus, and congenital staphyloma of the cornea.

b.—IRIS, VITREOUS, LENS.

482. EVERSBUSCH. Comparative anatomical examinations on the finer structure of the muscles of the iris, with special regard to the question of a dilator. *Ber. über d.* 16. *Versamml. d. ophth. Ges. in Heidelberg*, Rostock, 1884.

483. HAENSELL. Recherches sur le corps vitré. *Bull. des quinze-vingts*, vol. ii., 3.

EVERSBUSCH (482) has found that a dilator of the pupil does not exist either in the form described by Henle-Merkel, or in that described by Grünhagen, Schwalbe, and Eversbusch. The sphincter does not send any ramifications to the periphery of the iris. In animals with slit-shaped pupils the elements of the sphincter radiate in a marked manner toward the periphery of the iris from the two ends of the longer diameter of the pupil.

HAENSELL (483) studied the changes which the hyaloid membrane and vitreous undergo when irritated chemically or mechanically. The principal change consists in thickening of the vitreous

tissue, the same as in inflammation of the uveal tract and retina. When no adhesion exists between the hyaloid membrane and retina, the former becomes detached and the vitreous shrinks toward Cloquet's canal ; but when the two membranes are united, the central canal dilates and the vitreous thickens towards the retina. When only partial adhesion exists the changes correspond. To bring about detachment of the retina the cells of the vitreous must be converted into connective tissue.

V. MITTELSTÄDT.

c.—RETINA, OPTIC NERVE, BRAIN.

484. ANGELUCCI. Sul decorso delle fibre nel chiasma dei mammiferi e sul centro visivo delle cortece cerebrali. *Gaz. med. di Roma*, vol. x., Oct. 20, 1884.

485. RAMPOLDI. Materiale da servire allo studio istologico della retina dei mammiferi. *Ann. di ottalm.*, vol. xiii., 5.

486. UHTHOFF. The course of the fibres of the optic nerve. *Ber. über de* 16. *Versamml. d. ophth. Ges. in Heidelberg*, Rostock, 1884.

According to ANGELUCCI (484) there is almost a total decussation of the fibres of the optic nerve in the rabbit, a semi-decussation in the lower parts of the chiasma in man and the dog. The author has accurately measured and microscopically examined the optic nerves of two persons suffering from one-sided atrophy of the nerves. In regard to the centre of vision the author has found that when the second gyrus of the dog is destroyed, sensitive blindness of the eye of the other side results, while the eye of the same side becomes slightly amblyopic.

DANTONE.

RAMPOLDI (485) describes the methods of treating histological specimens of the retina, with special regard for the intergranular layer.

UHTHOFF (486) assumes that the optic nerve is a slightly twisted strand, in which the fibres of the periphery take a slightly spiral course, while the papillomacular bundle forms the axis of the optic nerve in its posterior part, but farther forward gradually turns outward and finally lies in the papilla like a wedge, the apex towards the central blood-vessels.

V.—PHYSIOLOGY.

a.—GENERAL PHYSIOLOGY.

487. SAMELSOHN-BJERRUM-BULL. Importance of testing the sensibility for light in practical ophthalmology. Internat. med. Cong. at Copenhagen ; *Centralbl. f. prakt. Augenhk.*, 1884, p. 330.

b.—CORNEA.

488. AUBERT. Does the curvature of the cornea approach most nearly to the ellipse ? *Arch. f. d. g. Phys.*, vol. xxxv., p. 597.

AUBERT (488) has found on the cornea two zones of different curvature, a marginal zone and a polar zone ; the curvature of the flat marginal zone rapidly increases and passes over into the strongly and almost evenly curved polar zone. The marginal zone adapts itself to the anatomical conditions of the eye, while the polar zone fulfills the optical conditions. The shape of the eye-ball is such that the part enclosed by the sclera about represents a sphere with a radius of 11–12 *mm.* ; the cornea then begins at the margin of the sclera with the same curvature as that of the latter, and then gradually merges in the corneal section of greater curvature, in that zone of the cornea which is of no consequence for optical purposes, as the rays of light falling upon it are shut off by the iris. Then follows that part of the cornea which is of importance for vision ; it extends from 12° to 16° all around the line of vision, and is so curved that the rays of light falling upon it are concentrated upon the retina. This polar zone may, therefore, be called the optical zone, the marginal one, the scleral zone. The bounding line between them is determined by the iris and pupil.

c.—RETINA AND BRAIN.

489. ANGELUCCI. Una nuova teoria sulla visione. *Gaz. med. di Roma*, vol. x., pp. 18 and 19.

490. BURNETT. Are there separate centres for light-, form-, and color-perception ? *Arch. of Med.*, vol. xii., 2, Oct., 1884. Mainly a criticism of Wilbrandt's paper.

491. ENGELMANN. The movements of the retinal cone- and pigment-cells under the influence of light and the nervous system. *Arch. f. d. ges. Phys.*, vol. xxxv., p. 498.

492. RICCÒ. Fenomeno di colorazione soggettiva prodotto dalla lue palpebrale. *Ann. di ottalm.*, vol. xiii., 5.

ANGELUCCI (489) has continued his interesting studies on the reaction of the pigment-epithelium to light (*v.* vol. xi., 3, p. 375, these ARCH.), and after examining into the reaction of the rods, cones, and visual purple, he comes to the following conclusions: Vision is the result of the physical and chemical changes produced by white and colored light in the cells of the retinal epithelium and in the outer segment of the rods and cones. These parts of the retina are the sensitive medium, which is variously irritated by the different kinds of light; the perception of this irritation takes place in the nervous portions of the rods and cones, while the consciousness of what has been seen is an act of the cortical substance of the brain. DANTONE.

ENGELMANN (491) has found that the inner parts of the cornea become shorter under the influence of light and elongate again in the dark. This photo-mechanical reaction of the cones seems to be produced by all parts of the visible spectrum, but it is probable that the more refrangible rays act with greater intensity. When only one eye is illuminated, the cones of the other show the same reaction. If the brain, however, is destroyed, the reaction is limited to the illuminated eye. The cones and pigment can be set in motion also by reflex irritation from distant parts of the body.

RICCÒ (492) has observed in himself the following subjective sensation: When awaking in a bright room, he sees letters held before the eye red for 1–2 seconds, the white paper greenish. Practice enabled him to observe the phenomenon without previous sleep, by closing the eyes, bending the head forward and exposing it for a short time to direct sunlight. The author attributes the phenomenon to the light being made red by passing through the lids filled with blood, the light being perceived as red upon those portions of the retina which are not illuminated (corresponding to the black letters), and in the contrast-color, green, on the parts which are. If the eyes are shaded with the hand or bandaged while exposed to the sunlight, the phenomenon is not perceived. DANTONE.

d.—COLOR-PERCEPTION.

493. AUGSTEIN. Disturbance of the color sense in neuritis. *Arch. f. Augenhk.*, vol. xiv., 3, p. 347.

494. CHARPENTIER. Rechérches sur la perception différentielle des couleurs. *Arch. d'ophth.*, Dec., 1884.

495. HOCHEGGER. The historical development of the color-

sense. Innsbruck, 1884. Neglects the physiological side completely, and does not give any thing new. Is rather a step backward than forward.

496. HOLMGREN. On the color-sense. Internat. med. Congr. at Copenhagen. *Centralbl. f. prakt. Augenhk.*, p. 333.

497. HILBERT. A peculiar phenomenon of the exhaustion of the nervous visual apparatus and its relation to erythropsia. *Klin. Monatsbl. f. Augenhk.*, 1884.

498. JEFFRIES. Education of the normal color-sense. *Circular of Information of the Bureau of Education.* Washington, 1884, No. 4.

499. LIBBRECHT. Color-blindness. Internat. med. Cong. at Copenhagen. *Centralbl. f. prakt. Augenhk.*, 1884, p. 330.

500. LUSSANA. Sull udizione colorata. *Giorn. internaz. di sci. med.*, vol. vi., 9.

501. REDARD. Color-blindness. Internat. med. Congr. at Copenhagen. *Centralbl. f. prakt. Augenhk.*, 1884, p. 330.

502. VELARDI. Della udizione colorata. *Giorn. internaz. di sci. med.*, vol. vi., 7.

CHARPENTIER (494) examined with his differential photometer (described in the *Arch. d'ophth.*, vol. ii., No. 5, p. 418) the differential sensibility of the eye for colors, one of equal brightness, two of the same degree of saturation, and three of the same "visual intensity." He comes to the following conclusions: The differential sensibility depends upon the intensity of illumination. For the same intensity of illumination it is the greater the less refrangible the color. For all colors as well as for white light the fraction is differentially (additional illumination divided by the illumination of the background) inversely proportioned to the square root of the illumination at the time being. For the same illumination of the back-ground a color is more easily distinguished on a white surface than on one of the same color, and best on a surface of the complementary color. When the degree of saturation is the same, the differential sensibility is equal for all colors. Also when the "visual intensity" is the same.

v. MITTELSTÄDT.

HOLMGREN (496) has found that the spectra of all color-blind persons are shortened in a varying degree. Yellow is not a primary color, being composed of red and green. Red, green, and violet are certainly the primary colors.

HILBERT (497) ascribes erythropsia to irritation of the central nervous system.

LIBBRECHT (499) has examined 8,000 railroad employés and found 2.6 per cent. color-blind. Holmgren's method gave excellent results, while Stilling's plates were less satisfactory.

LUSSANA (500) remembers that as early as 1872 he mentioned two students from Parma in the Piccola biblioteca medica and 1873 in his Fisiologia dei colari who had aural sensations distinctly associated with conceptions of color. High voices produced the sensation of red, low ones of black. A bass voice sounded black, a baritone dark-brown. The low notes of the female voice produced the sensation of brown, in a higher scale reddish-brown, and finally red.

REDARD (501) describes a lantern with three sliding glasses of different color for testing for color-blindness.

VELARDI (502) compiles the cases of colored aural sensations thus far observed and discusses the views of the origin of this peculiar phenomenon.

VI.—ANOMALIES OF REFRACTION AND ACCOMMODATION.

BY DR. HORSTMANN.

503. FÖRSTER. The influence of concave glasses and the convergence of the axes on the further development of myopia. *Arch. f. Augenhk.*, vol. xiv., p. 295.

504. HORSTMANN. Contribution to the development of the refractive conditions of the human eye during the first five years of life. *Arch. f. Augenhk.*, vol. xiv., p. 328.

505. HERSING. Examination of the eyes of 2,132 scholars. Appendix No. 1 to the medical report on the elementary schools of Alsace-Lorraine. Strasburg, 1884.

506. FITZGERALD. Influence of errors of refraction in affections of the conjunctiva. *Brit. Med. Jour.*, Nov. 22, 1884, p. 1012.

507. WEISS, L. Contributions to the anatomy of the myopic eye. *Mitth. a. d. ophth. Klin. in Tübingen.* vol. ii., 1, p. 57.

HERSING (505) examined the eyes of 2,132 scholars, and found myopia in only 2–3 per cent. among the country pupils, but 9–14 per cent. among the town pupils. At the age of 10–12 myopia

seems generally to be due to an accommodative spasm ; after that age to changes in the form of the globe.

FITZGERALD (506) calls attention to the fact that frequently the refraction is not correctly determined on account of affections of the conjunctiva lids, cornea, and iris. FITZGERALD.

WEISS (507) publishes an examination of two myopic eyes : one had a myopia of moderate, the other a myopia of high degree. In both the sclera with the thinned choroid penetrated far into the substance of the optic nerve at the nasal edge of the optic foramen. The retina did not extend quite so far, while the pigment-epithelium reached as far as the sclera and choroid in the first case, in which it was well preserved ; in the second it was atrophic. At the temporal edge of the optic foramen the reverse was the case. The sclera and choroid ended here in an obtuse angle, while the pigment-epithelium and outer layers of the retinal were entirely absent in the immediate neighborhood of the papilla. [Important, but not new.—ED.]

VII.—AFFECTIONS OF THE LIDS.

508. ALLPORT, FRANK. On Hotz's entropium-operation. *Amer. Four. of Ophth.*, vol. i., 6, p. 186.

509. BONO. L'iunesto cutaneo nell' oculistica operativa. *Gaz. de Clin.*, 1884, vol. xx., 6–7.

510. GIRAUD, F. Traitement du l'entropion et du trichiasis par le procédé de Hotz. *Thèse de Paris*, 1884.

511. TERRIER. Rapport sur deux travaux de Messrs. Vieusse et Trousseau touchant la thérapeutique de l'entropion et du trichiasis par les cautérisations au thermocautère. *Soc. du chir.*, Nov. 25, 1884.

512. SAINT MARTIN. Phlegmon de la paupière supérieure determiné par la pénétration d'une corps étranger. *Bull. des quinze vingts*, 1884, No. 2.

513. SAINT MARTIN. Cautérisations ponctuées dans le blepharospasme. *Ibid.*, No. 2, p. 86.

514. SAINT MARTIN. Phlegmon gangréneux de la paupière supérieure de l'œil droit consécutivement à un traumatisme. *Ibid.*, No. 3, p. 146.

515. SAINT MARTIN. Paralyse faciale et gangrène de la paupière supérieure consécutivement à une rougeole. *Ibid.*, No. 3, p. 145.

516. Saint Martin. Gangrène partielle de la paupière inférieure dans le cours d'une scarlatine. *Ibid.*, No. 3, p. 144.

517. Gallenga. Contribuzione allo studio dei tumori delle palpebre. *Gazz. d. clin.*, vol. xx., p. 35.

Allport (508) calls attention to the advantages of Hotz's operation.

Girard (510) recommends the same operation, which he has modified by applying a blepharostat, making the incision nearer the edge of the lid and inserting more sutures; in partial trichiasis he performs it only to a corresponding extent.

v. Mittelstädt.

Bono (509) has transplanted several flaps without a pedicle in a girl aged twenty, who had marked ectropium of the right lower lid, the result of extensive lupus-scars. After first performing tarsoraphy and loosening the cicatricial tissue, the wound, measuring about 12 sq. *cm.* in extent, was covered at both ends with flaps taken from the upper arm, and when after twelve days they had taken hold, the remaining central granulating surface was covered with a third flap. Union took place rapidly, beginning at the centre of the flaps, which retracted considerably and cast off their epidermis. After nine months the lids were separated again. The operation was completely and permanently successful.

Dantone.

Terrier (511) reports on the methods of Vieusse and Trousseau of treating entropium; the former draws three lines 1½ *cm.* long with the thermocautery vertically to the margin of the lid, the latter parallel to the margin. The former reports on more than forty, the latter on more than ten cases. Monod operated once according to Trousseau in a case in which Gaillard's method had failed, and saw an entropium converted into an ectropium. Trelat destroys the hair-follicles with the galvano-cautery according to Caron de Villars in partial trichiasis. v. Mittelstädt.

Gallenga (517) describes a true melanotic sarcoma which he excised from the upper lid of a woman aged sixty-six. The tumor, which sprang from the tarsus and had penetrated the whole thickness of the lid, had attained the size of a hazel-nut, and consisted of a large, highly pigmented nodule embedded in the centre of the lid, and two smaller ones, above and below the other; one of the smaller nodules was only slightly pigmented, the other not at all. Dantone.

VIII.—DISEASES OF THE LACHRYMAL APPARATUS.

518. KEYSER, P. D. Neoplasm of the lachrymal gland. *Jour. of the Amer. Med. Assoc.*, Oct. 25, 1884.

519. EMRYS-JONES. Lead-styles in treatment of lachrymal obstructions. *Brit. Med. Jour.*, Oct. 4, 1884, p. 652.

KEYSER (518) removed a tumor originating in the lachrymal gland. The microscopic examination showed that it consisted partly of small round cells, partly of the inflamed and infiltrated lachrymal gland. A relapse occurred later, which was also removed and proved to be a round-cell sarcoma.

EMRYS-JONES (519) inserted a lead-style for stricture of the lachrymal duct in a man aged thirty-five. In a fortnight he returned with total necrosis of the cornea, but it is doubtful whether the lead-style had any thing to do with this condition.

FITZGERALD.

IX.—MUSCLES AND NERVES.

520. BJELOW. Determination of the dynamic equilibrium of the muscles. *Wjestnik Ophth.*, July, Oct., Nov., Dec., 1884.

521. EALES. Divergent strabismus. *The Lancet*, 1884, vol. ii., No. 26.

522. RAMPOLDI. Singolarissimo caso di equilibrio motorio oculo-palpebrale. *Ann. di ottalm.*, 1884, vol. xiii., 5.

523. DUJARDIN. Ptosis bilatéral isolé. *Jour. des sci. méd. de Lille*, 1884. No. 16, p. 611.

524. DÉJERINE. Paralysie bilatérale des releveurs de la paupière chez un ataxique. *Prog. méd.*, 1884, No. 43, p. 850.

BJELOW (520) described in 1881 in an appendix to his dissertation (contribution to the knowledge of the conditions under which the dynamic equilibrium is maintained between the internal and external recti muscles of eyes with different degrees of refraction), a method for determining the dynamic equilibrium of the muscles of the eye. He found that equilibrium exists only when the power of abduction is to that adduction as 1:2, no matter whether the eyes are emmetropic or corrected ametropic eyes. The method consists in producing equilibrium by means of abducent prisms, whose power expresses the degree of insufficiency and is determined according to the formulas I (insufficiency of the interni) $= \frac{2\,Ab - Ad}{3}$ and E (insufficiency of the externi) $= \frac{Ad - 2\,Ab}{3}$. The present investigations are intended to strengthen the conclu-

sions arrived at in his dissertation ; the author also compares the different methods and concludes that his is superior to those of Albr. v. Graefe and Alfr. Graefe. Numerous tables are appended.

HIRSCHMANN.

RAMPOLDI (522) describes a peculiar disturbance of motility, probably congenital, which he observed in an otherwise healthy girl four and one-half years old. The action of the lids was jerky, spasmodic, and not synchronous on both eyes, *i. e.*, the upper lid of one eye was raised while that of the other fell. The influence of the will was absent, only in sleep both lids were closed. The right eye was turned outward and could not leave this position ; only when the lid was raised it turned inward a little, but did not reach the median line. The left eye was turned outward when the lid was closed, but the other movements were not so completely nullified as in the right. The pupils reacted promptly, but were widely dilated when the eyes were closed ; when these were opened the pupils contracted, accompanied by oscillations synchronous with the twitchings of the levator palpebræ. The clonic contractions of the muscles of the lids and iris were also observed in sleep, during which the right eye was not completely closed, and appeared more prominent. Refraction and accommodation were normal, as far as this could be determined, also the fundus. The action of atropine and myotics took place more slowly, and lasted a shorter time than in healthy eyes.

DANTONE.

DUJARDIN (523) saw ptosis suddenly develop in both eyes in an otherwise healthy man aged twenty-two, who had been suffering for some time from dizziness. As all the other muscles and the pupils were normal, Dujardin ascribes the affection to a lesion of a centre common to both levators. The application of the constant current and the use of strychnine brought about complete recovery in four months. v. MITTELSTÄDT.

DÉJERINE (524) found the levator palpebrae and its nerve degenerated on both sides in a case of tabes. v. MITTELSTÄDT.

X.—ORBIT AND NEIGHBORING CAVITIES.

525. AUB, J. Two cases of orbital tumors. *Amer. Jour. Ophth.*, 1884, vol. i., 8, p. 243.

526. EATON, F. B. Cellulitis and periostitis of the orbit as sequels of other morbid conditions with cases. *Trans. Oregon State Med. Soc.*, 1884.

527. Hunicke, W. Case of syphilitic periostitis of the orbit. *Amer. Jour. Ophth.*, July, 1884.

528. Fontan. Mécanisme de l'emphysème orbito-palpébral (suite et fin). *Rec. d'ophth.*, 1884, No. 10, p. 594.

529. Chauvel. Rapport sur un cas d'exostose éburnée du frontal, remplissant la cavité orbitaire. Ablation avec la gouge et le mallet. *Rev. de chir.*, August, 1884, p. 685.

530. Rampoldi. Esoftalmo intermittente da enfisema dell' orbita. *Ann. di ottalm.*, 1884, vol. xiii., 3–4.

531. Lloyd. Proptosis from thrombosis of the cavernous sinuses. *Ophth. Rev.*, 1884, p. 906.

532. Frank, F. Topographie comparée des systèmes nerveux oculopupillaire et cardiaque accélérateur; application au goître exophthalmique. *Compt. rend. off. des séances de la soc. de biol.* S. du Mai 3, 1884.

533. Galup, J. Quelques considérations sur le traitement du goître exopthalmique par l'iode et ses composés. *Thèse de Paris*, 1884.

534. Gruel. De l'hydrothérapie dans le goître exophthalmique. *Progr. méd.*, 1884, No. 20, p. 404.

535. Dianoux. Des troubles visuels dans le goître exophthalmique. *Ann. d'ocul.*, vol. xcii., p. 168.

Eaton (526) relates two cases of cellulitis and periostitis of the orbit in patients convalescent from typhoid fever; in one it is probable, however, that a carious tooth may have been a factor. Another case was probably due to syphilis. Burnett.

In Hunicke's (527) there was exophthalmus, hardness of the eyeball and diplopia. Under antisyphilitic treatment the patient recovered. Burnett.

Fontan (528) discusses orbital emphysema and mentions the case of a convict, who, in order to remain in the hospital, produced emphysema of the orbit by inflicting a slight injury with a pin at the root of a molar tooth and then blowing in air from the mouth. Marckwort.

Rampoldi (530) mentions an emphysema of the orbit which had developed without an injury from a chronic coryza. The affection developed during sleep, the lids beginning to swell, and the left eye becoming slightly prominent and deviating. These symptoms disappeared after a few days, but the exophthalmus and diplopia returned very often when the patient sneezed or

coughed, and could be produced at will by compressing the air when the mouth and nose were closed; distinct crepitation was then audible. The patient after a while always placed his hand on the eye when about to make a forcible expiration, to prevent the exophthalmus or at least press back the eyeball into position. The same condition still existed a year later. DANTONE.

LLOYD (531) observed the case of a boy who had been beaten about the head by a school-fellow, and had had epistaxis for three days when he was admitted to the hospital. A free discharge of watery fluid from the ear and a dirty-colored liquid from the nose followed, his strength failed, he became unconscious and finally died. The post mortem showed a fracture of the base of the brain and aneurisms of the internal carotid and basilar arteries, which had caused the exophthalmus. FITZGERALD.

FRANK (532) points to the common origin of the fibres supplying the muscles of the eye and the accelerators of the heart, which coming from the cervical part of the spinal cord, unite in the first pectoral ganglion. As the vaso-motor nerves of the head, the upper extremities, the lung, etc., take the same course, the large number of symptoms in affections of the cord or ganglion, as observed in Graves' disease, is easily comprehended.

V. MITTELSTÄDT.

GALUP (533) recommends one grm. of iodide of potash against Graves' disease, and in marked vascular and cardiac symptoms bromide of potash, which advice he bases on the observation of three cases.

GRUEL (534) recommends hydrotherapeutics against Graves' disease as soon as the first symptoms appear. V. MITTELSTÄDT.

XI.—AFFECTIONS OF THE CONJUNCTIVA, CORNEA, AND SCLERA.

536. GARRIGUES, H. J. Prevention of ophthalmia neonatorum. *Amer. Jour. Med. Sci.*, Oct., 1884.

537. AUBERT. Deux observations d'ophthalmie blennorrhagique. *Lyon méd.*, Oct. 5, 1884.

538. DERBY, R. H. Notes on contagious ophthalmia in some of the asylums of New York City. *Med. Rec.*, Nov. 1, 1884.

539. KOLIPINSKI, L. Treatment of scrofulous conjunctivitis with nasal catarrh. *Med. News*, Sept. 27, 1884.

540. Awsitidisky. Treatment of ocular affections. *Russkaja med.*, 1884, No. 19.

541. Reich. Note on sublimate in trachoma. *Wjestnik Ophth.*, 1884, vol. i., 6, p. 510.

542. Iwanow, S. D. Sublimate in diseases of the eye. *Russkaja med.*, 1884, No. 42.

543. Pernice. Il sublimato corrosivo in oculistico. *Gazz. d'ospit.*, vol. v., p. 83, 1884.

544. Schneller. Treatment of trachoma by excision of the fornix. *v. Graefe's Arch. f. Ophth.*, vol. xxx., 4, p. 131.

545. Andrews, J. A. Trachoma and the etiology of jequirity ophthalmia. *Arch. of Med.*, 3, June, 1884. *N. Y. Med. Jour.*, vol. xl., 4, p. 104.

546. Rampoldi e Boggi. Sul jequirity. *Ann. universali di medicina*, Aug., 1884.

547. Lundy, Ch. Jequirity and some of its ill effects. *Amer. Jour. of Ophth.*, vol. i., 11, p. 210.

548. Warlomont. Jequirity. *Ann. d'ocul.*, vol. xcii., p. 188.

549. Schulin, Ch. Some experiments with jequirity. *Med. Rec.*, Nov. 23, 1884.

550. Troitzky, S. Jequirity in hospital practice. *Russkaja med.*, 1884, No. 30.

551. Ficano. Del jequirity nella cura del tracoma. Palermo, 1884.

552. Gossetti. Il jequirity nella terapia oculare. *Riv. Ven. di sci. med.*, No. 4, 1884.

553. Gotti. Il jequirity nella clinica oculistica di Bologna. *Riv. clin.*, vol. xxiii., Sept. 9, 1884.

554. Cocci. Sull' influenca della risipola sul tracoma. *Gazz. d'ospit.*, vol. v., p. 81, Oct., 1884.

555. Awsitidisky. Two cases of conjunctival trachoma cured by erysipelas. *Russkaja med.*, 1884, No. 47.

556. Parisotti, O. Contribution à l'étude des tumeurs benignes de la conjonctive. *Rec. d'ophth.*, 1884, No. 10, p. 575.

557. Ficano. Un caso di dermoide o neoplaso della congiuntiva. *Ann. d. ottalm.*, vol. xiii., 6, p. 568.

558. Schleich. Xerosis of the conjunctiva. *Mittheil. aus d. ophth. Klin. zu Tübingen*, 1884, vol. ii., 1.

559. SCHULZ, R. Contribution to the knowledge of xerosis of the conjunctiva and infantile corneal necrosis. *v. Graefe's Arch. f. Ophth.*, vol. xxx., 4, p. 61.

Three hundred and fifty-one children delivered in a year at the New York Maternity Hospital were treated, as GARRIGUES (536) reports, according to Credé's method without a single occurrence of ophthalmia; one case only, in which the application was neglected, had inflammation of the eye sresulting in corneal opacity.

AUBERT (537) reports two cases of mild blennorrhœa in men with chronic conjunctivitis, who a short time previously had acquired gonorrhœa. In both gonococci were found.

V. MITTELSTÄDT.

DERBY (538) found that in an asylum for boys 29 per cent. had contagious ophthalmia; in that for girls, 19 per cent. In another large institution 28.5 per cent. of the seniors and 36 per cent. of the juvenile department for boys were affected. In the department for girls 30 per cent. of the seniors were affected. The communicability of the affection was illustrated by the fact that when a group of children were presented in succession, they were habitually those which occupied adjacent seats in the class-room. [The word "contagious" must have been used in a very broad sense; I have never seen such a percentage of contagious ophthalmia in any asylum of New York City.—H. K.] BURNETT.

KOLIPINSKI (539) reports three cases which he treated by causing the patients to snuff up the nostrils a solution of fifteen grains of the potassium chlorate to the fluid-ounce of water. When the children were too young to snuff up the solution, it was dropped into the nostrils with a pipette. All made excellent recoveries, though the local treatment of the eye was suspended. BURNETT.

AWSITIDISKY (540) observed symptoms of irritation and even formation of vesicles after the long-continued use of a two-per-cent. solution of boracic acid for cleansing the conjunctival sac in trachoma. The trachoma itself was not affected at all by the boracic acid. He therefore substituted in acute trachoma a solution of sublimate, 1 grm. to the pound [about 1 : 500, or gr. i. : ℥ i., which seems rather strong.—H. K.], with which he cleansed the conjunctival sac five to six times daily, and saw marked improvement. He also recommends this solution in phlyctenular conjunctivitis and keratitis. HIRSCHMANN.

REICH (541) recommends solutions of sublimate, weak ones for disinfection in contagious affections of the conjunctiva, especially

in the army; stronger ones for the purpose of irritation, to be washed off immediately afterward (like in cauterizations with nitrate of silver), in concentration of 1–3 gr. to the ℥ in follicular trachoma. In the latter affection Reich saw large granules disappear with comparative rapidity, while the surface of the mucous membrane, though diffusely infiltrated, became smooth.

HIRSCHMANN.

IWANOW (542) did not observe any marked benefit follow the application of instillations of sublimate (1–2 grms. : lb. 1), either in simple conjunctivitis or in trachoma. HIRSCHMANN.

PERNICE (543) recommends sublimate in corneal ulcers and purulent conjunctivitis. The author has determined by experiments that pus from lachrymal abscesses which has been for a while in a sublimate solution of $\frac{1}{10000}$, can be vaccinated into the cornea of rabbits without the slightest result. If the pus is not disinfected, infiltrations, deep ulcers, and even suppuration of the whole eye are the consequence.

SCHNELLER (544) excised the whole fornix in twenty-six cases of trachoma. He found that this greatly shortened the clinical treatment; the linear scar had no evil effect, the corneal affections healed very rapidly, and relapses of the trachoma and the pannus dependent upon it did not occur. Schneller believes that excision of the fornix is of advantage also in other affections of the cornea, accompanied by swelling of this fold.

As the result of his experience, ANDREWS (545) thinks it best to begin with a weak—say 2-per-cent.—solution. The berries should be husked, crushed, and macerated for about six hours in cold distilled water, and then filtered; thirty hours should elapse between each application. Preëxisting purulency is a contra-indication to the employment of the remedy. He has used it in this may in one hundred and forty cases of diseases of the conjunctiva and cornea with no untoward result. BURNETT.

RAMPOLDI and BOGGI (546), although not too enthusiastic over the new remedy, consider the application of jequirity an advance in therapeutics. In seventeen cases observed the effect was quite marked, especially on the pannus. The authors are not satisfied with the efforts made to connect the action of the remedy with the microscopic appearance of the infusion prepared and treated in different ways, and they are inclined to assume a special chemical principle. DANTONE.

LUNDY (547) relates some cases in which the result of the jequirity treatment had not been happy. BURNETT

The *Ann. d'ocul.* (548) contains two answers to Wecker's last paper on jequirity (*Ann. d'ocul.*, vol. xcii., p. 5), with remarks by WARLOMONT. PARISOTTI makes a few remarks on determining facts.

SCHULIN (549) makes a careful selection of his cases. He never uses the remedy in children nor in fresh cases of granulations with hyperæmia. Nor has he proposed it in the dry, yellow, sago-grain granulations, and he never dares to treat granulations during one of the attacks of inflammation so common in the disease. He uses a 2-per-cent. solution applied three times in nine hours. BURNETT.

TROITZKY (550) has employed the jequirity-treatment in fifty-one cases, among them one of not inflammatory trachoma, and seven with pannus. Complete recovery (after 3–7 months of continuous, repeated treatment) was observed in sixteen cases, marked improvement in nineteen, none in eleven, and in four not even jequirity-ophthalmia. The pannus was much improved in three cases, somewhat in two, and remained unchanged in two. Troitzky earnestly recommends jequirity in every obstinate case of trachoma. HIRSCHMANN.

FICANO (551), GOSSETTI (552), and GOTTI (553) are very much in favor of jequirity, and praise especially its effect on pannus. DANTONE.

COCCI (554) reports on a patient with trachoma who became affected with erysipelas of the face during treatment. When the eyes were examined after recovery the granulations had disappeared, the pannus had cleared up almost entirely, and a deep marginal ulcer of the cornea had filled up. The author ventilates the question of inoculating erysipelas for therapeutical purposes. DANTONE.

PARISSOTTI (556) publishes a paper in which he tries to prove that the neoplasms of the conjunctiva usually designated as polypi should not bear this name, but that of papillomas. MARCKWORT.

FICANO (557) observed in a girl aged six a dermoid of the conjunctiva, situated in the upper outer quadrant of the globe, one *cm.* from the corneal margin on a conjunctival elevation extending to the fornix. The grayish tumor was the size of a lentil, and bore about twelve fine hairs ½ *cm.* long, arranged in a horizontal line, which turned upward and lay close against the globe. It was covered by the upper lid, and did not give rise to any annoy-

ance. He thinks the little tumor was congenital; he had also seen a similar one on the conjunctiva of a dog. DANTONE.

SCHLEICH (558) examined three cases of xerosis of the conjunctiva, two with hemeralopia, and one without any functional disturbance, for the bacilli discovered by Kuschbert and Neisser, and found them. He saw similar bacilli, however, in almost every case of slight chronic conjunctivitis. Vaccinations with cultivated bacilli produced no effects on rabbits.

SCHULZ (559) reports a case of xerosis of the conjunctiva with suppuration of the cornea, which terminated fatally. He also believes the disease to be of parasitic origin.

560. PURTSCHER, O. Un caso di cheratite punctata albescens. *Boll.*, vol. vi., 2, p. 137.

561. SCHADEK, K. Cases of corneal affections, the result of acquired syphilis. *Wjestnik Ophth.*, vol. i., 3, p. 362.

562. FERRET. Note sur la kératite d'Hutchinson. *Bull. de la clin. nat. ophth. de l'hosp. des quinze-vingts*, vol. ii., 3, p. 139.

563. LEPLAT. De l'origine syphilitique de la kératite parenchymateuse. *Ann d'ocul.*, vol. xcii., p. 143.

564. LANDESBERG, M. A. New method of treatment in deep ulcers of the cornea. *Med. and Surg. Rep.*, 1884, vol. li, No. 18.

565. WIDMARK, J. Bacteriologiska studier öfver dacryocystitis och ulcus serpens corneæ. *Nord. Med. Ark.*, 1884, vol. xvi., No. 25.

566. NAGEL. A pathological phenomenon of circulation in the cornea. *Mitth. a. d. ophth. Klin. in Tübingen*, 1884, vol. ii., 1, p. 158.

567. BOUCHER. Contribution à l'étude des corps étrangers de la cornée. *Rec. d'ophth.*, 1884, No. 12, p. 711.

568. ANDREW. Use of the cautery in eye-practice. *Ophth. Rev.*, Nov., 1884.

569. PANAS. L'irido-sclérotomie. *Arch. d'ophth.*, vol. iv., 6, p. 481.

570. SCHIESS-GEMUSEUS. Congenital staphyloma of the cornea. *v. Graefe's Arch. f. Ophth.*, vol. xxx., 3, p. 195.

571. RAMPOLDI. Contribuzione alla storia clinica della cheratocono. *Ann. di ottalm.*, 1884, vol. xiii., 3–4.

572. FALCHI. Fibroma della cornea. Atti della *R. Accad. di med. di Torino*, Torino, 1884.

573. JEGOROW. Case of epibulbar melanotic sarcoma of the eye. *Wjestnik Ophth.*, 1884, No. 4.

574. ALT, A. On the microscopical changes found in a tattooed cornea. *Amer. Jour. Ophth.*, vol. i., 1, p. 8.

In the keratitis described by PURTSCHER (560) and considered very rare there were about fifteen white infiltrations the size of a pinhead, with clear spaces between them in the parenchyma of the lower half of the cornea. The author ascribes the disease to syphilis, on account of the participation of the uvea and on account of the prompt effect of anti-syphilitic treatment (first inunction, then iodide of potash), which caused the exudations to disappear after the lapse of fifty days. No other symptoms of syphilis were detected in the patient. DANTONE.

SCHADEK (561) observed, nine months after the primary infection, periostitis, papulous eruption, laryngeal affection, recurrent, plastic syphilitic iritis, a marginal ulcer resembling a phlyctenula, finally, intense parenchymatous diffuse keratitis in both eyes, with a few superficial small infiltrations in the left. Recovery, after energetic inunction and the internal use of iodide of potash, in two months ; only a few synechiæ remained. HIRSCHMANN.

Without wishing to deny the great variety of causes of parenchymatous keratitis, FERRET ascribes the form accompanied by the well-known deformities of the teeth to syphilis in every case. The disease of the parents is always of recent date.

V. MITTELSTÄDT.

LEPLAT (563) declares himself in favor of Hutchinson's theory as to the etiology of parenchymatous keratitis, and bases his belief on the numerous observations made at Fuchs's clinic. Arlt's classification of (1) lymphatic (scrofulous) keratitis, and (2) keratitis due to hereditary syphilis (Arlt, Klin.-Darst. d. Krankh. d. A., pp. 111 and 116), he considers rather artificial than natural. The syphilitic nature was certain in eighteen of the twenty-eight cases observed by Leplat, while in two cases only, there were no indications of syphilis. The paper contains many interesting details, especially as to the simultaneous occurrence of parenchymatous keratitis with other syphilitic affections. He also reports a case of parenchymatous keratitis with hypopyon. MARCKWORT.

WIDMARK (565) has made inoculations with bacteria bred pure from dacryocystitis and then used them up to the 21st generation. He obtained positive results in all cases and could demonstrate the infiltration with bacteria in the cornea. He, then, again culti-

vated the bacteria taken from the corneal ulcer on the rabbit's eye, and inoculated them into another cornea with positive results. The bacteria when inoculated into the cornea produced an infiltration, and five days later caseous foci were found. The bacteria bred from these again produced positive results when inoculated into the cornea of a rabbit.

NAGEL (566) found that the phenomenon of circulation in the cornea previously observed by him, as well as by Rampoldi and Denti, namely, the transitory appearance of blood- and lymph-corpuscles in the deeper layers of the cornea, is due to a slight hyphæma or hypopyon in which coagulation has not taken place. The corpuscles are concealed behind the scleral margin when the head is carried erect, but appear in shape of stripes or spots on Descemet's membrane, when the head is bent forward.

BOUCHER (567) publishes a paper in which he tries to prove from the clinical history of five cases that the prickles of the chestnut, the cactus, etc., when they enter the cornea, do not produce infection.

PANAS (569) performed the following operation, which he has frequently done since, and has named iridosclerotomy, in a case of a large corneal ulcer with a hernia of Descemet's membrane, no anterior chamber and greatly increased tension, in which iridectomy was impossible: A cataract knife was passed in from below and outward 1 *mm.* from the corneal margin. As soon as the point appeared in the anterior chamber, the knife was pushed along behind the iris, until it appeared at the symmetrically situated point. The iris and sclera were then cut, except a bridge of the latter 2–3 *mm.* wide; in withdrawing the knife the edge was turned forward in order to cut the peripheral parts of the iris from behind. The result was very satisfactory. Panas recommends the operation in cicatrical staphyloma, occlusion of the pupil, loss of the anterior chamber and increased tension, etc., and reports three cases more. In two of them the result was not very satisfactory. The operation may also be done as a preliminary to iridectomy. Distension of the posterior chamber is a necessary condition for iridosclerotomy, which, however, cannot always be demonstrated with certainty, as the third case shows. Nevertheless, Panas has no fear of injuring the lens.

v. MITTELSTÄDT.

In the five cases of keratoconus observed by RAMPOLDI (571) among eight thousand eye-patients the apex of the cornea was

never clear. In four of them marked improvement was obtained by long-continued use of atropine, and a compressive bandage, general treatment, and nourishing diet—the symptoms of irritation disappearing, and the cornea becoming flatter. Eserine rather made the condition worse. DANTONE.

A small corneal tumor extirpated by FALCHI (572) at the Turin clinic was situated on the lower half of the cornea. It was smooth, white, tinged with red from the blood-vessels, 6–7 *mm.* wide and 3–4 *mm.* high. The corneal tissue surrounding it was somewhat opaque at the line of contact and ectatic, otherwise normal. Under the microscope the tumor proved to be a pure fibroma springing from the connective tissue of the cornea. The epithelium covering the tumor was normal; in the outer layers only cells were found in various stages of mucous degeneration. The fibres of the fibroma were parallel to the epithelium in the outer layers, in the lower ones very irregularly arranged; a few blood-vessels traversed the tumor. The neoplasm had developed in the course of nine years; after it had been removed, a broad, solid scar formed on the cornea, which had not changed when seen five years later. DANTONE.

JEGOROW (573) reports a case of epibulbar melanotic sarcoma of the eye. The tumor which was almost the size of a fist, was situated at the lower inner margin of the cornea. Thus far (three years later) no relapse. HIRSCHMANN.

575. CASPODI. Massage in ophthalmology. *Wiener med. Wochenschr.*, 1884, No. 29.

576. SNELL, S. Wounds of the sclerotic, with remarks on their treatment by suture. *Ophth. Rev.*, 1884, vol. iii., 36, p. 300.

577. JOYE, J. A. The treatment of wounds of the sclerotic through the conjunctiva. *Amer. Jour. Ophth.*, 1884, vol. i., 10, p. 216.

578. SAINT-MARTIN. Gomme de la sclérotic. *Bull. des quinze-vingts*, 1884, No. 1, p. 34.

JOYE (577) reports two cases in which Schöler's method of closing the scleral wound with the conjunctiva was successfully performed. In both some vision was preserved. BURNETT.

SAINT-MARTIN (578) saw a gumma of the sclera develop under the insertion of the external rectus, four years after the infection, which had never been treated. It soon disappeared under the influence of specific remedies. V. MITTELSTÄDT.

579. Koller, K. The application of cocaine for producing anæsthesia of the eye. *Wiener med. Wochenschr.*, 1884, Nos. 43 and 44.

580. Königstein. Muriate of cocaine and its application in ophthalmology. *Allg. med. Centralztg.*, vol. xliii., No. 89. *Wiener med. Presse*, 1884, Nos. 42 and 43.

581. Howe, L. Cocaine as a local anæsthetic for the eye. *Fortschritte d. Med.*, 1884, No. 22.

582. Merck, E. Cocaine and its salts. *Zeh. klin. Monatsbl. f. Augenhk.*, vol. xxii., p. 465.

583. Bass. Cocaine as a mydriatic. *Ibid.*, p. 481.

584. Hirschberg, J. Cocaine in ophthalmology. *Centralbl. f. prakt. Augenhk.*, 1884, p. 345.

585. Hirschberg, J. The surgical anæsthesia in operations on the eye. *Berl. klin. Wochenschr.*, 1884, Nos. 50 and 51.

586. Horstmann, C. On muriate of cocaine. *Deutsch med., Wochenschr.*, 1884, No. 49.

587. Höltzke, H. The physiological action of cocaine on the eye. *Zeh. klin. Monatsbl. f. Augenhk.*, vol. xxii., p. 457.

588. Weber, A. The local application of cocaine to the eye. *Ibid.*, 443.

589. Reichenheim, M. Contribution to the effect of cocaine upon the eye. *Ibid.*, p. 462.

590. Schenkl. Cocaine, a local anæsthetic for the eye. *Prager med. Wochenschr.*, 1884, No. 45.

591. Purtscher, O. The anæsthetic action of cocaine upon the eye. *Centralbl. f. prakt. Augenhk.*, 1884, p. 372.

592. Nieden. On cocaine in galvano-cauterization of the eye. *Ibid.*, p. 374.

593. Zieminsky, B. Experimental and clinical contributions to the question of the application of cocaine in ophthalmology. Dorpat, 1884, Schnackenburg.

594. Kerner, J. Muriate of Cocaine in ophthalmic practice. *Wjestnik Ophth.*, vol. i., 6, p. 531.

595. Zacharyewitsch. The question of the local action of cocaine on the eye. *Wratsch*, 1884, No. 49.

596. Kazaurow, J. N. The local action of cocaine on the eye. *Wratsch*, 1884, No. 43.

597. KAZAUROW, J. N. A few words more on cocaine in ophthalmology. *Wratsch*, 1884, No. 45.

598. NOYES, H. D. Cocaine. *Med. Record*, Oct. 11, 1884.

599. AGNEW, C. R., MOORE, W. O., MINOR. *Med. Rec.*, Oct. 11, 1884.

600. KNAPP, H. Hydrochlorate of cocaine. *Med. Rec.*, 1884, No. 17, p. 461.

601. BULL, ST. The hydrochlorate of cocaine as a local anæsthetic in ophthalmic surgery. *N. Y. Med. Jour.*, vol. xl., 22, p. 609.

602. ALT, A. Clinical experiences with the muriate of cocaine. *Amer. Jour. Ophth.*, vol. i., 8, p. 225.

603. AYRES, S. C. A clinical report on some uses of muriate of cocaine in ophthalmic surgery. *Amer. Jour. Ophth.*, vol. i., 8, p. 238.

604. GREEN, J. Notes on some of the physiological effects and practical applications of cocaine hydrochlorate. *Ibid.*, p. 231.

605. HUNICKE, W. Experiences with hydrochlorate of cocaine. *Ibid.*, vol. i., 8, p. 229.

606. CRAWFORD. Note on the value of hydrochlorate of cocaine in ophthalmic surgery. *The Lancet*, 1884, vol. ii., No. 23.

607. HARTRIDGE, G. The action of hydrochlorate of cocaine on the eye. *Med. Times and Gaz.*, 1884, No. 1705.

608. MURELL, W. Cocaine ; the new local anæsthetic. *London Med. Rec.*, 1884, No. 114, p. 516.

609. MEYER, E. L'anesthésie locale de l'œil par la cocaine. *Rev. génér. d'ophth.*, 1884, No. 10, p. 433.

610. PANAS. Emploi du chlorhydrate de cocaine. *Bull. de l'acad. de méd.*, 1884, No. 47.

611. VULPIAN. Action anesthésique du chlorhydrate de cocaine. *Gaz. hebd.*, 1884, No. 47, p. 770.

612. LANDOLT. La cocaine. *Arch. d'ophth.*, 1884, vol. iv., No. 6, p. 535.

613. BOBONE. La cocaine en ophthalmologie. *Ann. d'ocul.*, vol. xcii., p. 228.

614. GALEZOWSKI. De la cocaine et de son action anesthésique sur l'œil. *Rec. d'ophth.*, 1884, No. 12, p. 703.

615. Fano. Anesthésie locale de l'œil. *Jour. d'ocul.*, Dec., 1884.

616. Armaignac. De la cocaine et principalement de son emploi en chirurgie oculaire pour produire l'anesthésie locale de la cornée et de la conjonctive. *Rev. clin. d'ocul.*, Nov., 1884.

617. De Magni and Denti. La cocaine nella chirurgia oculare. *Gazz. d'ospit.*, 1884, vol. v., pp. 98–102.

618. Graselli. La cocaine nella terapia oculare. *Gazz. med. Ital. Lomb.*, 1884, No. 49.

619. Peer d'Houy. La cocaina in oculistica. *Ibid.*, No. 49.

The application of cocaine marks a new era in ophthalmology. The first notice of it was given by Brettauer, Sept. 14, 1884, at the ophthalmological congress at Heidelberg. He reported that C. Koller, in Vienna, had observed a transitory but complete anæsthesia of the conjunctiva and cornea after instillation of a 2-per-cent. solution of the drug. Muriate of cocaine is an alkaloid prepared from the leaves of erythroxylon coca (Lamarck), a plant indigenous to South America, especially Peru and Bolivia. Niemann, a pupil of Wöhler, was the first who prepared it in 1859. Its crystals belong to the monoclinic system, they melt at 98° C., are easily soluble in alcohol and ether, but only in 704 parts of water at 12° C.; its salts however readily dissolve in water. In 1862 Schroff made the the first experiments with it. After doses of 0.05 grm. per os, he observed in rabbits variations of the pulse and respiration, transitory mydriasis and anæsthesia of the mucous membrane of the tongue. When the same dose was injected subcutaneously the animal died under epileptiform convulsions and with marked mydriasis. Latterly Sigmund Freud again examined the drug. He found that a solution of muriate of cocaine produced transient anæsthesia of the mucous membranes. Incited by this Koller (579) was induced to test its influence on the conjunctiva and cornea. He obtained the following results: if a few drops of an aqueous solution of muriate of cocaine are dropped upon the eye of a rabbit, guinea-pig, or dog, complete anæsthesia of the conjunctiva and cornea results in ½–1 minute. If, however, the cornea is cut through, the animals manifest great pain the moment the aqueous escapes and the iris prolapses. The inflamed cornea also can be rendered entirely insensible with cocaine. The total anæsthesia lasts about 10 minutes when a 2-per-cent. solution is instilled. If a few drops of a 2-per-cent. solution are put into the

human conjunctival sac, a slight burning sensation is felt, which entirely disappears after ½–1 minute, and is followed by an indefinable feeling of dryness. The palpebral fissure seems larger; the cornea and conjunctiva are entirely insensible to touch. This total anæsthesia lasts about 7–10 minutes, and then after a longer stage of reduced sensibility the normal condition is reëstablished. About 15–20 minutes after instillation the pupil begins to dilate. The dilatation, which however is never a maximum one, is greatest the first hour, then gradually disappears in a few hours. A slight paresis of accommodation accompanies and disappears with the mydriasis. There is also marked ischæmia of the conjunctiva, especially that of the lids. The anæsthetic action can be prolonged by repeated instillations, and is especially noticeable in those parts which have been directly and for a longer space of time in contact with the solution. Koller thinks that a 5-per-cent. solution instilled every 5 minutes for about half an hour, also reduces the sensibility of the deeper parts, the sensibility of the globe to greater pressure being markedly reduced.

Königstein (580) also experimented with cocaine and obtained about the same results as Koller. He used a 1-per-cent. solution and observed the well-known effects, insensibility of the conjunctiva and cornea, anæmia of the former, enlargement of the palpebral fissure, protrusion of the globe, and dilatation of the pupil. These effects are not so marked with stronger solutions (10-per-cent.), as the drug is then not so easily soluble, and it irritates if hydrochloric acid is added. Königstein also performed tenotomies and iridectomies without causing pain, as in the latter operation he instilled cocaine once more after the incision. He also reports that he enucleated an eye of an unfettered and not narcotized dog, after having injected a 1-per-cent. solution into Tenon's capsule, without any manifestation of pain on the part of the animal. He used the remedy for relieving pain in the phlyctenular affections, combustion of the cornea, cyclitis and herpes zoster, and for contracting the blood-vessels in iritis—the drug acts not only on the peripheral sensitive terminations of the nerves, but probably also upon the sympathetic nerve.

Lucien Howe's (581) series of experiments confirmed the anæsthetic action; he found that 2 drops of a 0.2 per-cent. solution produced a perceptible mydriasis, but twice as large a dose was required to affect the sensibility. In stronger doses the anæsthesia of the cornea and conjunctiva is always noticed before the mydriasis. A

2-per-cent. solution is best for producing total anæsthesia ; stronger ones are not much more effective. The maximum effect is reached in about 15 minutes, and then gradually subsides in the course of 30–40 minutes. At first only the conjunctiva and cornea are affected, afterwards also the iris, but never so completely as the former parts, not even when the aqueous is removed with a syringe and replaced with a 2-per-cent. solution of cocaine.

HIRSCHBERG (585) has used cocaine with good results in almost all operations on the eye, especially in a large number of cataract-extractions. He believes that local narcosis with cocaine will replace general narcosis in most operative procedures, at least in adults.

HÖLTZKE (587), who dissolved cocaine in a sublimate solution of 1:5,000, observed the well-known effects of the drug after instilling a 5-per-cent. solution, but did not notice any influence on the accommodation. He believes that it irritates the sympathetic nerve.

A. WEBER (588) and others call attention to a perceptible reduction of the corneal and scleral tension after instillation of the remedy. All these observations indicate that cocaine will be extensively applied, especially in ophthalmology. Koller (*l. c.*) recommends it as a narcotic in painful ocular affections, especially those of the cornea and conjunctiva associated with pain and photophobia, and in iritis. It is most useful, however, as a narcotic in operations on the eye, especially in removing foreign bodies from the cornea, tattooing corneal opacities, in pterygium operations, and in cauterizing corneal ulcers. The corneal or scleral section in iridectomies and cataract-extractions was absolutely painless, while in the succeeding acts of the operations the pain was much reduced.

KNAPP, HORSTMANN, and REICHENHEIM (589) found cocaine useful in treating strictures of the lachrymal duct. The patient feels no pain until the knife or probe has passed the stricture. All observers are united in recognizing the usefulness of cocaine in operations of the conjunctiva of the globe and lids, and on the cornea. HIRSCHBERG (*l. c.*), DOR, and others recommend it also for enucleations, as they found that the pain was greatly diminished.

Cocaine is of the greatest value in treating corneal ulcers with galvano-cautery, as the total anæsthesia of the cornea permits the destruction of even the minutest traces of disease with the electric loop. NIEDEN (592) first called attention to this. He could

safely touch the floor of an ulcer and control the action of the glowing point to such an extent as to limit its action to single layers of the cornea.

In operating for squint the incision of the conjunctiva is painless, but the seizing, hooking, and cutting of the tendon was accompanied by pain, according to the observations of KNAPP (*l. c.*), HORSTMANN (*l. c.* 586) and others.

KAZAUROW (596, 597) made experiments on the local action of cocaine on the eye. He used a vaseline-salve containing 5 per cent. of cocaine and afterwards aqueous solutions of 5–10 per cent. He found that the sensibility of the conjunctiva and cornea is much reduced; that the pupil dilates, first below; that with stronger (10 per cent.) solutions the near point recedes from the eye; that V is not affected, and that the palpebral fissure is enlarged. He also observed pallor of the conjunctiva and less hemorrhage after using the solution (not the salve). Operations (removal of foreign bodies, extractions) are almost painless. Even in an enucleation, performed after instilling cocaine, the pain was very slight.

HIRSCHMANN.

KNAPP (600) injected a 4-per-cent. solution into the orbital tissue, and could then enucleate an eyeball for a melano-sarcoma of the choroid with scarcely any pain. In one case, after an injection of a 4-per-cent. solution, and in another, after injection of a 3-per-cent. solution, he observed peculiar symptoms of collapse, so that he advises caution in injecting it subcutaneously (0.06–0.12 grm.).

KNAPP'S (600) experiments show that a 2–4-per-cent. solution of cocaine reduces the sensibility of the eye, produces moderate mydriasis, limits the accommodation to a slight extent, and causes ischæmia of the conjunctiva. He never observed that it produced pain or any disturbances. He also tested the effect of the remedy on the mucous membrane of the ear, mouth, nose, trachea, larynx, urethra and rectum, and noted in all abolition of sensibility.

E. MEYER (609) confirms the results obtained with cocaine, Among other physiological effects he also found a reduction of the intraocular pressure. He recommends it in operations, for instance in excising chalazia, by dropping it into the wound, making the remainder of the operation, scraping out with a curette, painless. At present he is using it in a salve against the photophobia accompanying some kind of corneal affections.

V. MITTELSTÄDT.

PANAS (610) confirms the diminished effect of cocaine on an inflamed eye. In tenotomy only the seizure of the tendon with the hook is painful. Dujardin-Beaumetz calls attention to the use of cocaine in laryngology, in affections of the stomach, and in opium-eaters. v. MITTELSTÄDT.

VULPIAN (611) observed marked exophthalmus, enlargement of the palpebral fissure, mydriasis, anæsthesia of the cornea, and reduced sensibility of the extremities in a dog under the influence of curare and in one not thus affected after injecting cocaine into the veins. A peculiar motor disturbance seems to be due to a kind of drunkenness. The secretions were not affected, with the exception of an increased discharge of saliva from the submaxillary gland. v. MITTELSTÄDT.

LANDOLT (612) also observed the well-known effects of cocaine. He used it also in probing the lachrymal ducts, less for subcutaneous injection, when only one patient acknowledged insensibility at the point of introduction. The iris and deeper layers of the cornea were not affected. v. MITTELSTÄDT.

BOBONE (613) has mainly prepared a compilation of the numerous papers which have appeared on the action of cocaine on the eye from Sept.–Dec., 1884. He adds the results of his own experiments, of which those on points still under discussion are of interest. The anæsthetic effect of cocaine, when caustics were used, varied in different patients, in one there was no effect whatever. General narcosis was not resorted to in removing the whole staphylomatous section of the eye of a child aged eleven, cocaine being instilled before and during the operation. The boy did not cry and scream. Whether cocaine also effects the deeper parts of the eye is doubtful.

GALEZOWSKI (614) found that the action of cocaine is rapid in men in middle life, but soon disappears, while in old men it is slower but lasts longer. Women stand between the two in this respect.

ARMAIGNAC (616) also publishes an article on cocaine. That part of it is especially interesting which discusses the communications which appeared before that of Koller. Gaedcke (1855), Percy (1857), and Niemann (1859), all claim to have been the first to prepare pure cocaine. Armaignac differs from others by maintaining that cocaine sensibly diminishes the tension of the eye. MARCKWORT.

DE MAGNI and DENTI (617) have made numerous experiments

with cocaine on the eyes of animals, as well as on healthy and diseased human eyes. Among animals the eye of the frog is most susceptible to the remedy, then follow the rabbit, dog, cat, fowl, and pigeon. In the last-named anæsthesia can scarcely be produced. In rabbits the cornea becomes insensible in about three minutes, but the animal re-acts when the iris is seized ; if cocaine is again applied after penetrating with the knife into the anterior chamber, the iris also becomes insensible.

XII.—IRIS.

By Dr. NIEDEN.

620. v. Duyse. Aniridie double congénitale avec déplacement des cristallins. *Ann. de la soc. de méd. de Gand.* S. du 7 Oct., 1884.

621. Fuchs, E. Case of syphilitic iritis. Anatomical investigations. *v. Graefe's Arch. f. Ophth.*, vol. xxx., 3, p. 139.

622. Saint-Martin. Gomme supurée de l'iris. *Bull. des quinze-vingts*, 1884, No. 1, p. 34.

623. Saint-Martin. Kyste perlé de l'iris. *Bull. des quinze-vingts*, April–June, 1884, No. 2, p. 85.

Van Duyse (620) observed aniridia in both eyes of a boy aged ten, with dislocation of both lenses upward. Between their edge and the periphery of the pupillary area (s. v. v. !) he noticed fine radiating fibres, which he considers the zonula. He could not find the slightest trace of the ciliary processes. v. Mittelstädt.

Fuchs (621) gives an anatomical description of two eyes affected with iritis in the second (condylomatous) stage of syphilis. All the other parts of the eye were also affected. He found inflammation of the uveal tract, atrophy of the optic nerve and in the vitreous cellular infiltration. The iris contained small circumscript tumors which could not be recognized with the naked eye and whose centre contained typical giant cells. The atrophy of the optic nerve was secondary.

Saint-Martin (622) observed specific iritis and development of a gumma five days after the appearance of secondary symptoms. The gumma disintegrated and formed a hypopyon. Recovery with occlusion of the pupil. v. Mittelstädt.

Saint-Martin (623) observed after a perforating corneal wound a pedunculated cyst developing from the incarcerated

piece of iris; it relapsed after being punctured, and was finally removed by cutting the pedicle. V. MITTELSTÄDT.

XIII.—CHOROID.

624. CARO. La pilocarpina nelle malattie oculari. *Giorn. internaz. de sci. med.*, 1884, vol. vi., 6.

625. GRAHAMER, C. Contribution to the pathological anatomy of congenital hydrophthalmus. *v. Graefe's Arch. f. Ophth.*, vol. xxx., 3, p. 265.

626. HAAB, O. Further communications on tuberculosis of the eye. *Zeh. klin. Monatsbl., f. Augenhk.*, vol. xxii., p. 391.

627. HÄNSELL. Recherches sur la cyclite. *Bull. de la clin. des quinzt-vingte*, 1880, vol. ii., p. 49.

628. HIRSCHBERG, J. On metastatic sarcoma of the choroid. *Verh. d. Heidelb. ophth. Gesellsch.*, 1884, p. 112.

629. KIPP, P. J. A case of serous irido-choroiditis of both eyes, ending in total blindness. *Amer. Jour. Ophth.*, Sept., 1884.

630. LANGL, O. The diagnosis of intraocular sarcoma. *Zeh. klin. Monatsbl. f. Augenhk.*, vol. xxii., p. 410.

631. SAINT-MARTIN. Déchirure de la chorioide avec mydriase maxime consécutive à un traumatisme. *Bull. de la clin. des quinze-vingts*, 1884, No. 1, p. 39.

632. PROUT, T. S. Plastic exudative cyclitis. *Amer. Jour. Ophth.*, Sept., 1884.

633. REISSMANN, J. A case of tubercular choroiditis with spontaneous perforation of the sclera and sub-conjunctival tissue. *v. Graefe's Arch. f. Ophth.*, vol. xxx., 3, p. 251.

CARO (624) obtained very satisfactory results in three cases of exudative choroiditis, three of serous retinitis, and one of sclero-choroiditis posterior by injecting pilocarpine subcutaneously.

DANTONE.

GRAHAMER (625) gives a detailed account of a case of congenital hydrophthalmus, and concludes from it that serous irido-choroiditis is the primary affection, the change in the cornea being due to the increased intraocular tension produced by the disease just mentioned. The decrease in calibre of the veins of Leber's plexus and the obstruction of Fontana's space farther serve to augment the tension.

HAAB (626) describes a tumor of the choroid, the microscopical

examination of which at the time did not quite clear up its nature, whether tubercular or gliomatous. It was taken from a girl aged thirteen, and her brother dying suddenly of phthisis of the lungs, the tumor was again examined especially for tubercle-bacilli. They were found in large numbers, although the tumor had been put away for four years, thus confirming the diagnosis of a conglomerate tubercle of the choroid. The author made further experimental studies on the presence of bacilli in old hardened specimens of tuberculosis, and could demonstrate it in almost every case.

HÄNSELL (627) studied the cells of the pars cil. ret. in eyes which had been enucleated sooner or later on account of traumatic cyclitis. Experimental reproduction in the rabbit's eye of the changes observed in man failed (eleven detailed observations and clinical histories). Hänsell rarely observed division of the above-mentioned cells; generally the proliferation begins at the nucleus (Karyokinesis). The altered cell finally resembles Müller's radiating fibres or forms fibrillar connective tissue. The cells of the pars cil. ret., therefore, belong to the latter, and therefore in cyclitis continue their growth, so to speak, which had been interrupted by extrauterine life. The fibres of the ciliary muscles are forced apart by cicatricial contraction, which probably acts in a similar manner on the ciliary nerves, causing the ciliary pain. v. MITTELSTÄDT.

HIRSCHBERG (628) demonstrated microscopical specimens of a case of metastatic sarcoma of the choroid, removed from a woman aged twenty-eight, who had been operated for cancer of the breast. The left eye became affected soon after the operation under the symptoms of detachment of the retina; the autopsy revealed general sarcomatosis.

KIPP (629) gives a history in full of a case in which both eyes succumbed in succession, and in spite of active treatment, to serous irido-choroiditis. BURNETT.

LANGL (630) calls attention to the fact that the differential diagnosis between sarcoma of the choroid and simple serous detachment of the retina can often be made by oblique concentration of light upon the eye. Two cases are briefly reported.

PROUT (632) gives the histories of three cases of the condition which is sometimes called false glioma, from the fact that it is only met with in children. The microscopical examination of one eye was made by Dr. J. L. Minor, who found it to be "cyclitis

with a marked tendency to hemorrhagic exudations; all other appearances were secondary to this process." BURNETT.

REISSMANN (633) gives a clinical and anatomical description of a case of tuberculosis of the choroid in a woman aged forty-nine. The sclera ruptured spontaneously and the contents of the globe were partly discharged into the subconjunctival tissue. Typical miliary nodules with central giant cells and surrounded with epithelial round cells were found in the various tissues of the eye, as well as tubercle-bacilli. The latter were successfully transplanted. The iris and ciliary body were free from tuberculosis.

XIV.—GLAUCOMA.

634. CUIGNET. Du glaucome antérieur et du glaucome postérieur. *Rec. d' ophth.*, Nov., 1884, p. 639.

635. FUCHS, E. Glaucoma inflammatorium. *v. Graefe's Arch. f. Ophth.*, vol. xxx., 3, p. 123.

636. KAZAUROW, J. N. A case of sympathetic glaucoma. *Wjestnik Ophth.*, Nov., Dec., 1884.

637. LANDESBERG, M. Fulminant glaucoma in both eyes in a case of albuminuric retinitis. *C. f. A.*, vol. viii., p. 292.

638. MANFREDI. La lussazione spontanea del cristallino da ectopia lentis congenita ed il glaucoma secundario consecutivo. *Arch. per la sci. med.*, vol. viii., 9.

639. SARGENT, ELIZABETH. Anatomical contributions to the knowledge of glaucoma. With a heliotype plate. *C. f. A.*, vol. viii., p. 353.

CUIGNET (634) publishes an article in which he tries to give support to the two Demarres' division of glaucoma into anterior and posterior glaucoma by the anatomical and clinical description of two cases. MARCKWORT.

FUCHS (635) gives a post-mortem examination of two glaucomatous eyes, which however had retained some sight; iridectomy had been performed upon them eight years ago for acute glaucoma, which had cured the disease and prevented the development of an excavation. The greatest changes had taken place in the ciliary body (enlargement of the ciliary processes).—Epicritical remarks.

KAZAUROW (636) observed glaucoma in the left eye, with $V = \frac{11}{10}$, excavation, pain, colored rings, etc. In the right eye glaucomatous degeneration with iridodonnesis and tremulous

cataract (after injury of the right eye from a chip of wood five years ago). Rapid improvement of the left to $\frac{20}{30}$, after enucleation of the right eye, and disappearance of the colored rings and periodic fog. In the enucleated eye, in which the zonula was partly torn off, gelatinous turbidity and inflammatory thickening of the anterior portion of the vitreous, posterior part of the vitreous liquified. Fontana's spaces obliterated, the periphery of the iris united to the cornea, disc excavated.

HIRSCHMANN.

LANDESBERG (637) observed the development of fulminant glaucoma in both eyes, the second following the first after two days, without any apparent excavation of the papilla, in a patient under treatment for albuminuric retinitis, after the retinal exudation had subsided. After the iridectomy the eyes returned to the condition before the attack, but in a second case V was totally destroyed.

MANFREDI (638) attributes the secondary glaucoma in dislocation of the lens solely to mechanical occlusion of the pupil, thus preventing the escape of the aqueous, a theory which he bases on the observation of secondary glaucoma in two cases of dislocation of the lens. He therefore recommends extraction as the only rational treatment. DANTONE.

E. SARGENT (639) gives an anatomical description of six cases of glaucoma, three primary and three secondary, in all of which she found excavation of the optic nerve, obliteration of the angle of the iris, and cellular infiltration of the anterior part of the sclera and of the cornea in as far as exposed between the lids. Primary glaucoma differs from secondary in the condition of the retina. Frequently the optic nerve was infiltrated behind the lamina, around the central blood-vessels.

XV.—SYMPATHETIC OPHTHALMIA.

640. ALT, A. A case of sympathetic neuroretinitis. Remarks on sympathetic ophthalmia. *Amer. Four. Ophth.*, May and July, 1884.

641. DEUTSCHMANN, R. The pathogeny of sympathetic ophthalmia. *v. Graefe's Arch. f. Ophth.*, vol. xxx., 3, p. 77 and postscript, p. 331.

642. LANDESBERG, M. Case of sympathetic ophthalmia. *N. Y. Med. Four.*, Oct. 18, 1884.

Aside from the clinical case, ALT (640) reports results from ex-

perimentation, and arrives at the conclusion "that in this experimental case the material which caused an inflammation in one eye, as well as the resulting inflammatory process, have both travelled directly from the injured eye to its fellow, and not by the optic sheaths alone, but also by the optic nerve itself."

BURNETT.

DEUTSCHMANN'S (641) very interesting experiments on animals as to the genesis of sympathetic ophthalmia were made by injecting staphylo- or strepto-coccus pyogenes aureus, which produced direct infection and inflammation of the other eye in a very characteristic manner through the track of the optic nerve and chiasma, and can, therefore, be considered a paradigm of the infectious, sympathetic ophthalmia. Inflammation was noted only in the posterior portion of the second eye, as the animal died before propagation into the anterior portion could take place, which always requires several days, as shown by further experiments. Human eyes were examined for the purpose of proving that in eyes which had produced sympathetic ophthalmia in the other micro-organisms were the transmitters of these secondary affections. In five out of six cases he found the micro-parasites, neuritis and optic perineuritis, and infiltration of the optic nerve and its sheaths with pus-cells, as well as of the whole uveal tract. The micro-organisms (stapylococcus) found in the globes in seven fresh cases of sympathetic ophthalmia were cultivated, and when introduced into the animals produced the characteristic suppuration and secondary inflammation of the other eye. The author was fortunate enough to be able to demonstrate the same cocci in the bit of iris excised in an iridectomy from a human eye sympathetically affected. They rapidly proliferated when cultivated, which, when injected into animals, produced the same inflammation in the first eye as that described above, thus making it highly probably that the sympathetic ophthalmia of man is an inflammation transmitted from one eye to the other through the optic nerves, which was primarily induced either by micro-organisms or, in rare cases, by chemical irritation. As he always found a more or less marked neuritis and perineuritis of the second eye in his experiments on animals, an occurrence which in man, however, is rare, the author has compiled these cases in which marked optic neuritis was observed, and requests that in future special attention be paid to this point; finally, he proposes to change the name to "ophthalmia migratoria." Deutschmann then adds a case of

fresh sympathetic ophthalmia, in which he not only could demonstrate the cocci in the injured eye, but also in the deposit on Descemet's membrane of the eye secondarily affected with papillitis and neuro-retinitis; these cocci he cultivated, and successfully inoculated animals with them.

LANDESBERG'S (642) patient was a man forty-one years of age, who was struck in the left eye by a splinter of metal, July 13, 1881. When seen, the cornea showed a linear cicatrix running from near the centre to the edge. The lower half of the iris was disorganized, with a funnel-shaped depression in the centre and an elevation to the temporal side. The subjective symptoms of the other eye were amblyopia and paralysis of accommodation. Fingers were counted with the left eye at two feet peripherically. Landesberg, thinking that the foreign body must be found at the cicatrix, made an incision, and after removing a part of the iris, finally succeeded in bringing out an oblong piece of metal. V in right eye began to improve, and finally reached $\frac{12}{8}$; V in the left eye also became better. BURNETT.

XVI.—LENS.

643. BECKER, O. The etiology of cataract. *Verhandl. d. Heidelb. ophth. Vers.*, 1884, p. 78.

644. FRYER, B. E. Traumatic dislocation of the left crystalline lens inward, downward, and backward; spontaneous restoration to normal position with fair vision. *Amer. Jour. of Ophth.*, Sept., 1884.

645. KAZAUROW, J. N. Simplified cataract-extraction. *Wratsch*, No. 48. First attempts at extraction of cataract according to the simplified method. *Wratsch*, No. 50.

646. LANGE, O. The question of spontaneous absorption of cataractous opacities of the lens. *v. Graefe's Arch. f. Ophth.*, vol. xxx., 3, p. 211.

647. MEYER, E. On artificial ripening of cataract. *Trans. Internat. Med. Congr. at Copenhagen. Rev. Arch. f. Augenhk.*, vol. xiv., p. 366. Recommends Förster's method.

648. DEL MONTE. L'estrazione modificata della cataratta. *Movimento med. chir.*, vol. xvi., 3, 4, 5.

649. NOYES. Case of dislocation of the lens into the vitreous and method of extracting it. *Verhandl. d. Heidelb. ophth. Congr.*, 1884, p. 90.

650. SIMI. Intorno al secondo tempo della estrazione della cataratta capsulo-lenticolari e di quelle lenticulari mature ed immature, e della maturazione artificiale di queste ultime. *Boll. d'ocul.*, Sept.—Nov., 1884, vol. vi., 1, 2, 3.

651. WECKER. L'extraction simple. *Ann. d'ocul.*, xcii., p. 207.

652. WHITE, J. A. Remarks about cataract with the report of fifty-two cases. *Trans. Va. Med. Soc.*, 1884.

BECKER (643) denies Deutschmann's statement that chronic nephritis leads to cataract, and concludes, from extensive statistics, that there is no etiological connection between nephritis and opacity of the lens.

KAZAUROW (645) uses cocaine in cataract-extractions, fixes the lids and eyeball with the fingers, opens the capsule with a knife while making the section, catches the iris on the edge of the blade after making the counterpuncture and thus excises a piece of it, at the same time finishing the scleral cut. The cataract he removes by pressure upon the globe with the lower lid. He thus performs the whole operation with one instrument, the knife. He has operated eleven cases according to this method, and is satisfied with the results. HIRSCHMANN.

LANGE'S (646) was one of fluid hypermature cataract, in which the liquid cortex spontaneously cleared up to such a degree that V rose to $\frac{4}{60}$, while the irregularly shaped nucleus became smaller by maceration. The author believes that not only was the opaque cortex absorbed, but that it was replaced by transparent substance (?).

DEL MONTE (648) performed 138 modified linear extractions, with 2.18 per cent. loss, and 4.36 per cent. moderate results. In 47 cases the capsule was opened by a curved incision at the periphery parallel to the cut in the scleral margin, and before completing the latter; the knife is withdrawn immediately after the puncture, and a round division-needle passed in through the small opening. The author concludes that carefulness, on the part of the operator, is the most essential element of success in cataract-extractions. The kind of cataract has some influence on the result; but neither the age of the patient, nor the slight movements he may make, nor atmospheric conditions, nor antiseptic treatment can bring about a poor result or counterbalance the effect of a poorly-performed operation. DANTONE.

When the lens has been dislocated into the vitreous NOYES

(649) advises to place the patient in a prone position, then, when the lens has fallen forward, to fix it with a needle-like instrument passed in from behind through the sclera, then to change the prone to the supine position and complete the extraction by making a linear extraction. He reports a case of this kind.

SIMI (650) discusses at length the opening of the capsule in cataract-extraction. The cystotome he uses has a double edge, extending to within 1 *mm.* of the point of the instrument and lying not in the median line, but at the outer side, so as to penetrate as little as possible into the cortical substance. The author tries to obtain a triangular opening by twice applying the instrument. He is opposed to extraction within the capsule as a general method. As regards the artificial ripening of cataract he considers simple division less dangerous than Förster's method.

DANTONE.

Since the introduction of cocaine WECKER (651) has made it a rule to extract without performing an iridectomy, and considers extraction with iridectomy the exception. (He does not mention the papers of Galezowski and Chavernac, who, in 1883, recommended a return to extraction without iridectomy. (These ARCH., vol. xiii., 235, 237, 238.) A few drops of the cocaine-sublimate solution recommended by Sattler (cocaini muriat. 0.5 ; hydrarg. subl. corr. 0.002 ; aq. distill. 10.0) are instilled three to five minutes before the operation, especially upon the upper half of the cornea. Wecker performs his corneal section with a knife only half as wide as the ordinary Graefe knife. After the completion of the operation the wound is covered with a layer of iodoform 1 *mm.* thick. MARCKWORT.

Of the fifty-two cases operated by WHITE (652) three were lost, two from operation, and one from septic infection from a dirty sponge. One case is interesting from a physiological standpoint. The patient became blind from double cataract when seven years of age and was operated on at the age of thirty-two. The result was good as regards the operation, but he could judge nothing of the shape of an article until he touched it, nor could he locate properly the positions of objects in space. BURNETT.

XVII.—VITREOUS.

653. BRAUÈRE. Valeur thérapeutique des courants continus dans les troubles du corps vitré. *Gaz. des sci. méd. de Bordeaux*, 1884. *La quinzaine méd.*, Nov. 1, 1884.

654. CHISOLM, J. J. Removal of a piece of iron from the vitreous by means of the magnetic needle. *Trans. of Med. and Chirurg. Faculty of Md.*, 1884.

BRAUÈRE (653) treats opacities of the vitreous with the constant current of a Gaiffe battery of twenty-four elements, with galvanometer, current-counter and rheostat, with which to regulate the intensity of the current and insure a gradual increase and decrease at the beginning and end of the applicaction, to which he attaches great importance. The kathode he applied behind the ear, the anode to the eye. The intensity of the current at first should not exceed six milliampères, afterwards not ten. Duration five minutes at first, later eight to ten.

V. MITTELSTADT.

In CHISOLM'S (654) case a fragment of iron weighing four grains, $\frac{1}{8}$ inch long and $\frac{1}{4}$ inch wide, had penetrated the cornea, iris, and lens. A Gruening's magnet was introduced through the wound, and a second attempt brought the foreign body away. All inflammatory symptoms subsided in two weeks. A traumatic cataract remained. BURNETT.

XVIII.—RETINA AND FUNCTIONAL DISTURBANCES.

655. CALDERONE. Amaurosi traumatica temporanea bilaterale per commozione retinica. *Rev. clin.*, vol. xiii., July 7, 1884.

656. GUAITA. Anatomia e fisiologia patalogica della retinite pigmentosa. *Ann. d. ottalm.*, 1884, vol. xiii., 3–4.

657. HOTZ, F. C. Clinical notes on retinal hemorrhages. *Amer. Jour. Ophth.*, Sept., 1884.

658. DICKEY, J. L. A case of glioma retinæ. *Amer. Jour., Med. Sci.*, Oct., 1884.

659. RÜBEL. Case of amaurosis due to bromide of potassium. *C. f. A.*, p. 294. Observed in an insane epileptic. The report is too short to consider the diagnosis beyond doubt.

560. RYDEL. The treatment of detachment of the retina and the results obtained at Jagiella's ophthalmic clinic, at the University of Cracow. *Przeglad Lekarski*, 1884.

661. WADSWORTH, D. F. A case of permanent zonular scotoma of traumatic origin ; very small circle of central field with vision normal. *Amer. Jour. Ophth.*, Oct., 1884.

CALDERONE (655) relates an interesting case of commotion of the retina. A gun was fired close to the face of a young man,

without however producing any visible injury, with the exception of a few grains of powder which penetrated into the skin ; but vision was lost at once, V=o. No ophthalmoscopic changes. After the lapse of three hours central, after six hours peripheral perception of light returned. After twenty-four hours one eye had completely recovered, after forty-eight the other also.

DANTONE.

The microscopic examination made by GUAITA (656) of two eyes blind from retinitis pigmentosa showed the following :

Pigmentation of the retina most marked at the equator, gradually disappearing towards the ora serrata and extending back to within $\frac{1}{2}$ *cm.* of the fovea centralis ; the optic disc, projecting somewhat, lies at the edge of the round, unpigmented spot. With the microscope : Degeneration of the optic nerve fibres, much new connective tissue at the papilla. The retina has undergone material changes in all its layers. Larger remnants of the rods and cones, the visual cells, are found at the posterior pole and around the papilla, but nearer the equator they are all destroyed. The elements of the layer of ganglion-cells are well preserved near the optic nerve, gradually disappear farther forward, and are entirely absent at the line of the greatest pigmentation. Only the supporting-tissue has not suffered, and has even proliferated. The calibre of the blood-vessels was diminished by thickening of the walls, small branches were entirely obliterated, the blood-vessels are converted into fibrous cords. There are also traces of newly formed and again obliterated vessels. The pigment is collected in smaller or larger patches, especially on the walls of the blood-vessels, and there particularly at their bifurcations, in loose small granules or in polygonal cells, similar to those of the pigment-epithelium. At the points of greatest pigmentation the granules are distributed throughout the whole supporting-tissue, even far away from the blood-vessels. The pigment-epithelium itself has undergone marked changes, the cells have lost their regularity of form, size, and position,—in some spots they are collected in large masses and are grown together with the supporting-tissue, especially at the accumulation of pigment upon the blood-vessels. In view of these conditions the author considers retinitis pigmentosa an angiosclerosis of the retina, advancing from the periphery towards the centre, and due to a general nutritive disturbance, especially syphilis. As nutrition is interfered with on account of the thickening of the blood-vessels and the obliteration of the smaller

branches, a collateral circulation develops from the capillaries of the choroid, which passes through the pigment-epithelium and causes its cells to wander. The hemeralopia he attributes to a disturbance of the development of the visual purple, due to the changes of the pigment-epithelium. DANTONE.

HOTZ (657) observed retinal hemorrhages of unusual size in the region of the macula with perfect recovery of vision. The hemorrhage came on immediately after immersing the feet in cold water during menstruation. BURNETT.

In DICKEY'S (658) case a red reflex was noted from the child's left eye in its infancy. When eighteen months old it was removed, but no report was made of its examination. Six months later the right eye began to fail under all the appearances of glioma retinæ. The eye was removed and sent to Dr. Knapp for examination, who reported typical glioma. In six weeks metastatic tumors began to appear in the orbit and head. Death a year and a half after enucleation of the first eye. BURNETT.

RYDEL (660) found that detachment of the retina is the cause of blindness in about five per cent. of all cases, and that ninety per cent. of such eyes were myopic. The treatment consists in puncturing the sclera and in injecting pilocarpine. The clinical history of fifteen cases is given at greater length. Of these two were treated by puncture, three by puncture and injections of pilocarpine, and ten with injections only. The result was: Of the first five, one was a failure, two were perceptibly, and one only slightly, improved. Of the thirteen treated with injections of pilocarpine, three were failures, six were moderately improved, one markedly, and three were completely cured. Of the last-named, two had remained well more than a year later.

A man was run over by a wagon. WADSWORTH (661) found on the third day after the injury multiple hemorrhages in the retina of the right eye, with $V=\frac{14}{200}$, V in $L=\frac{14}{15}$. The hemorrhages were absorbed and V improved, but with a central scotoma, inside of which was a small field (2″ at 14 ft.), in which $V=\frac{14}{15}$. In a number of years the condition has remained unchanged.

BURNETT.

XIX.—OPTIC NERVE.

662. FOX, L. W. Clinical observations. *Amer. Jour. Ophth.*, July, 1884.

663. PARISOTTI et DESPAGNET. Fibrome du nerf optique. *Rec. d'ophth.*, Dec., 1884, p. 720.

664. SIMI. Sopra un caso di nevrite ottica. Storia e considerazioni. *Boll. d'ocul.*, Sept. 1, 1884, vol. vii., and *Rec. d'ophth.*, Oct., 1884, p. 603.

FOX (662) observed a case of acute uniocular neuritis. No history of syphilis, recovery complete as to vision. Quinine amblyopia cured by the internal administration of hydrobromic acid.

BURNETT.

PARISOTTI and DESPAGNET (663) describe a case of fibroma of the optic nerve; the neoplasm had begun in the outer sheath of the optic nerve, had entered and filled up the intervaginal space, and then had involved the inner sheath of the optic nerve.

MARCKWORT.

SIMI (664) observed a case of almost instantaneous blindness from optic neuritis after the use of one of Pagliano's cathartic powders (scammonium and colocynth). The patient, aged twenty-five, was seized, three days after taking the powder, with violent retention of urine and constipation. On the fourth day intense neuralgia of the 5th nerve and amblyopia developed, the latter increasing in course of forty-eight hours to absolute blindness of both eyes. The ophthalmoscope showed choked disc and œdematous infiltration of the retina in both eyes, dilated, tortuous veins, and ischæmic arteries of varying calibre. Bromide of potassium was given; perception of light returned after two days; after three days the patient could walk again alone; two months later V in the right eye was almost $\frac{8}{10}$, in the left $\frac{1}{10}$, field of vision complete; he was, however, blind for all colors except yellow, which was perceived in a narrow field in both eyes, and red, which was faintly perceived with the right in a very small circle. The author explains the ocular affection by assuming it to be a reflex action from the abdomen upon the sympathetic nerve.

XX.—INJURIES, FOREIGN BODIES (PARASITES).

665. CLIZBE, S. H. Foreign body remaining quiet in the eye for twenty-three years. *Amer. Jour. Ophth.*, Oct., 1884.

666. FANO. Rupture de la sclérotique par suite de violence exercée sur la région oculaire. Hernie sous-conjonctivale d'une portion du corps vitré. *Jour. d'ocul.*, May, 1884, p. 162.

667. KIPP, C. J. Clinical notes of cases of foreign bodies lodged in or on the iris and in the anterior chamber. *Amer. Jour. Ophth.*, July, 1884.

668 KRÜKOW, A. Removal of a needle from the eye with the electro-magnet. *Wjestnik Ophth.*, 11, Nov., Dec.

669. MANFREDI. Un caso di cisticerco sotto conjunctivale ed annotazioni istologiche sulla retina cisti avventizia. *Otti della R. Acc. di Med. di Torino*, 1884.

670. SAINT-MARTIN. Enucléation d'un moignon douloureux renfermant un corps étranger depuis 15 ans. *Bull. des quinze-vingts*, 1884, No. 2, April–June, p. 86.

671. PICQUÉ. Contusion oculaire par coup de poing. Perte immédiate de la vision. Absence de complications inflammatoires. Mort par scirrhose. Examen de l'œil. *Soc. anatom.* Séance du 25. Janv., 1884.

672. SHAFFNER, CHAS. Traumatic rupture of retina and choroid by a plush ball. *Med. News*, July 5, 1884.

673. WEBSTER, DAVID. Loss of an eye by traumatism; a phenomenal symptom. *N. Y. Med. Jour.*, Sept. 27, 1884.

In CLIZBE's (665) case the body was a piece of iron buckle $\frac{3}{4}$ in. long and $\frac{1}{16}$ in. diameter. There was much pain and inflammation at the time, but for 23 years it had occasioned no trouble. It was removed by forceps. BURNETT.

In FANO's (666) case the ruptured sclera healed in eight days after puncturing the conjunctiva and applying a compressive bandage; a sclero-choroidal staphyloma however developed later. v. MITTELSTÄDT.

KIPP (667) observed the following cases of injury of the anterior portion of the globe: 1. Fragment of steel in the lower part of the iris; removed with iridectomy eight days after entrance; recovery. 2. A piece of soft solder in the iris; extraction sixteen hours after the accident; complete recovery. 3. Fragment of iron in the iris; iritis on following day; iridectomy on second day; complete and speedy recovery. 4. A piece of iron in the iris; extraction of the foreign body five weeks after the accident; recovery. 5. Piece of iron on the iris; extraction without iridectomy; recovery. 6. Fragment of iron on the iris; extraction with magnet; recovery. 7. Burn of cornea; fragment of stone on the iris; extraction on second day; recovery. 8. A large piece of stone in the anterior chamber for two years without producing disturbance. 9. A bird-shot in the lower part of the anterior chamber for eight years without causing irritation. 10. Spontaneous expulsion through the cornea of a large piece of gun-cap four years after its entrance into the eye. BURNETT.

KRÜKOW (668) succeeded in removing with Hirschberg's electro-magnet a piece of needle twenty-four *mm.* [?—H. K.] in length after it had remained in the eye two weeks. The eye healed well.
HIRSCHMANN.

MANFREDI (669) describes a cysticercus which was situated under the conjunctiva of the globe in the upper inner quadrant of the right eye. The tumor, which was the size of a pea, began five to six *mm.* from the cornea and extended to the semilunar fold. It was easily excised. The microscopic examination of the cyst showed that its wall consisted of two concentric layers, the outer one of which consisted of compact connective tissue containing many capillary blood-vessels. The inner layer was composed of granulation-tissue with numerous giant cells, and covered here and there with flattened elements, which might prove to be endothelium, if examined according to other methods and in different stages. This cysticercus was the thirteenth observed in Italy, and the third subconjunctival one. DANTONE.

SHAFFNER (672) reports that when he examined the eye soon after the injury the left had M = 6 D and V = $\frac{1}{200}$; the uninjured right H = 1.5 D and V = $\frac{1}{30}$. The rupture had taken place as usual about the posterior pole of the eye. In 11 days there was H in left = 2.25 D and V = $\frac{1}{200}$, and neuritis had set in. Seven days later V in left eye was $\frac{1}{40}$. BURNETT.

WEBSTER (673) reports: The right eye was injured by a piece of steel from a broken chisel in 1874. V was reduced but not destroyed. In 1882 a cataract, with total posterior synechiæ, had developed. In 1883 he observed that blood would appear in the anterior chamber and disappear on quitting work. These hemorrhages occurred frequently, and could be brought about by bending the head forward. The eye was enucleated and there were found hemorrhages, recent, as well as old, in all the cavities, posterior synechiæ, commencing degeneration of the lens, complete detachment of the retina, with œdema and proliferating degeneration of the retina. BURNETT.

XXI.—OCULAR AFFECTIONS IN CONSTITUTIONAL DISEASES.

674. BIERWIRTH, A. M. A case of pernicious anæmia. *Amer. Jour. Ophth.*, Aug., 1884.

675. CALLAN, P. A. Atrophy of both optic nerves as a sequel of whooping-cough. *Amer. Jour. Ophth.*, Oct., 1884.

676. FRIEDENWALD, A. Uræmic amaurosis. *Med. News*, Aug. 9, 1884.

677. HUTCHINSON, J. Relation of certain eye-diseases to gout. *Brit. Med. Journ.*, Nov. 22, 1884, p. 995.

678. LITTLE, W. S. The value of pupillary symptoms in general disease. *Amer. Jour. Ophth.*, July, 1884.

679. OTTOLENGI e CONTI. Il senso cromatico nei sifilitici. *Gazz. d. clin.*, 1884, vol. xx.

680. PARINAUD. Troubles oculaires de la sclérose en plaques. *Prog. méd.*, 1884, No. 32, p. 641.

681. RAMPOLDI. Azioni riflesse dall' apparato digerente a quello visivo. *Ann. d. ottalm.*, 1884, vol. xiii., 3–4.

682. TUFFIER. Polyurie et hémianopsie d'origine traumatique. *Rev. de chir.*, Oct. 1884, No. 10, p. 827.

683. VOSSIUS. Lepra of the eye. Attempts at infection of rabbits by inoculation into the anterior chamber, in connection with a case of lepra Asiatica. *Verhandl. d. Heidelb. ophth. Gesellsch.*, 1884, p. 27.

In BIERWIRTH'S (674) case the ophthalmoscopic examination was made by Dr. Alt, and the usual signs of the disease were found: small arteries, large and tortuous veins and numerous striped hemorrhages. There was an improvement under the use of tonics. BURNETT.

CALLAN (675) supposes that in his case the atrophy was due to a neuritis set up by a congestion of the brain due to the whooping-cough. BURNETT.

After considering generally all the forms of eye-affection associated with uræmia FRIEDENWALD (676) gives the histories of two cases of sudden amaurosis without ophthalmoscopic signs due to uræmic poisoning. In one, due to pregnancy, premature labor was induced for the relief of the patient. BURNETT.

At the meeting of the Ophthalmological Society of the United Kingdom on Nov. 13, 1884, in honor of Sir William Bowman, HUTCHINSON (677) delivered a lecture on "The Relation of Certain diseases of the Eye to Gout." He defines gout as "all states of health which are, whether directly or remotely, connected with the accumulation of lithate of soda in the blood, as the result of over-feeding or defective assimilation." Hutchinson supposes the case of an individual subjected many years ago and for a long period to the ordinary causes of this form of gout, but who for

several years has avoided them. Though for a long time past his blood may have been free from urates, yet his tissues may be prone still to suffer in a peculiar manner when exposed to the ordinary exciting causes of diseases. If such an individual have children they will inherit his tissues and consequently his tendency to the various derangements from which he suffered. Hutchinson next proceeds to describe the various affections of the eye which are found associated with the gouty diathesis. The first is a condition which, for want of a better name, he has long been in the habit of recognizing as "hot-eye." It is one of the phenomena which attend quiet, *i. e.*, not acutely paroxysmal, gout. Usually one eye is affected. The conjunctiva becomes red and the eyeball feels hot, and pricks as if sand were in it; sight is slightly dim. Not infrequently it is the precursor of an attack of iritis. Hutchinson recognizes various forms of arthritic iritis, the common one being that in which the iritis occurs in acutely transitory paroxysms. The tendency to form adhesions is very great. The disease generally restricts itself to the iris and shows no tendency to disorganize the globe. He considers that the reason why gonorrhœal rheumatism so often causes iritis, is because it occurs usually to the subjects of inherited gout. There is another form of arthritic iritis which more frequently attacks women, a very considerable proportion of whom have a history of gout in former generations. This form is apt to spread to the ciliary body and choroid, to persist and to prove destructive. Those cases in which it occurs in association with glycosuria, are according to this experience almost always the subjects of gout also. Relapsing cyclitis and optic neuritis can rarely be traced back to gout, but hemorrhagic retinitis is rarely seen except in gouty persons. In summing up he divides the different affections into two groups: 1st, those which go with acquired, humoral or renal gout; 2d, those which accompany hereditary gout. In the one, attacks of a transitory nature are the rule, and these attacks are often acute and attended by much pain. In the second group, although a tendency to temporary recovery and recurrence is often observed, yet there is a great proneness to chronicity and persistence. "In the former group we have placed hot-eye, scleritis, recurrent iritis and hemorrhagic retinitis. All these are diseases of adult life. In the second group we have insidious disorganizing iritis, relapsing cyclitis, certain forms of soft cataract, and, perhaps, some of primary optic neuritis."

FITZGERALD.

The result arrived at by LITTLE (678) from his own observations (658 cases) and those of others is that in acute nervous diseases 23.3 % show some variations of pupillary condition from the normal, while in insanity of all grades the pupils are affected in 23.5 %. BURNETT.

OTTOLENGI and CONTI (679) found among 310 syphilitic individuals (276 with secondary, 34 with tertiary symptoms), who were tested with Holmgren's woollen skeins, 5 color-blind (1.61 %). No ophthalmoscopic changes were observed. The authors conclude that disturbances of color-perception, which may occur as the result of syphilitic changes in the retina and optic nerve, or in the cerebral centre of color-perception, must not be confounded with true, typical, congenital color-blindness. DANTONE.

PARINAUD (680) discusses the ocular symptoms in multiple sclerosis. Among the muscular disturbances nystagmus is the most important. Parinaud attributes it to paralysis of the centres of association, although it is present when paralysis is very difficult to demonstrate, or decreases while the latter increases. Inequality of the pupils is frequent in the beginning of the disease; afterward myosis is the rule, where the reaction to light and accommodative efforts remains, in contradistinction to tabes. Visual disturbances appear very gradually, and frequently are slight. Dyschromatopsia for red and green manifests itself early, the papilla appears only slightly effected, a little paler in the temporal half. In other cases the course of the disease is more rapid and complete, though only temporary blindness ensues, blindness not persisting in this affection, even in marked atrophy of the discs. A third form consists in monocular amblyopia with limitation of the visual field, but without dyschromatopsia. White atrophy of the optic nerve. v. MITTELSTÄDT.

RAMPOLDI (681) in discussing visual disturbances due to the digestive organs, mentions five cases of mydriasis, diplopia, amblyopia, asthenopia, and photophobia, together with neuralgic pains, in which these symptoms were traceable to helminthiasis (in four cases ascarides, in one taenia) and disappeared at once when the worms had been removed. DANTONE.

TUFFIER's (682) case was that of a laborer, in whom a fall had produced fracture of the frontal bone with deep depression of the bone. It was followed at once by deep coma, complete anæsthesia, and paralysis of the sphincter muscles. On the third day ecchymoses and chemosis of the conjunctiva. A few days later

a stage of excitation followed, during which the absence of paralysis of any kind was made certain. After two months incision of a phlegmonous abscess in the region of the wound, then gradual recovery. The most prominent symptoms were: great thirst, polyuria (10–12 litres of urine daily without albumen or sugar); adduction of the right eye slightly diminished, sense of smell impaired on the right side, V intact, right papilla atrophic. Temporal hemianopsia in both eyes. No sensory or motor paralysis. The polyuria was diminished by the use of ergot.

V. MITTELSTÄDT.

REVIEWS.

Clinical Studies on Diseases of the Eyes. By FERDINAND RITTER VON ARLT. Translated by LYMAN WARE, M.D., of Chicago. Published by P. Blakiston, Son, & Co., Philadelphia. Price $2.50. (Reviewed by Dr. J. A. SPALDING.)

Three or four years ago, von Arlt, the veteran ophthalmologist of Vienna, gave to the world the first part of a long promised treatise on the diseases of the eye, including those of the conjunctiva, cornea, iris, and sclera. At that time we read with much pleasure the original work, distinguished as it was for the clearness of its views concerning the ætiology, pathology, and prognosis of diseases of the eye as well as for the broadness of culture which it displayed in the treatment of these diseases. Without a single illustration to attract the reader, the solid learning displayed on every page enchained his careful attention. We have since patiently waited, though in vain, for the continuation of this excellent book. It is quite probable that Dr. Ware, the translator, felt, like ourselves, that here was a hand-book well worth turning into good English, but that it were better to delay so difficult a task until the continuation or conclusion appeared. Time having passed by, and von Arlt being still silent, the translation of his views has at last been accomplished, and here we have them before us in the form of a stately volume, yet not too heavy for the hands, with bold, clear type, pleasant borders, not too shiny paper, and ending with a moderately satisfactory, though by no means a copious index. It is on the whole a subject for regret that the index is not fuller, doubled up, as one might say. Thus, for instance, on page 131 we see a short section devoted to "Keratitis after intermittent fever," a topic, by the way, capable of development and well worth study and investigation by the practitioners of our Western States where malaria abounds. Nevertheless, in

the index, we look uselessly for such a title under the head of "Keratitis," while "intermittent fever" and "fever" and "malaria" are not mentioned at all. To be sure, we find "Keratitis, malarial," but one would more naturally have searched first for "malaria" or "intermittent fever," to see if there were any diseases of the eye associated with malaria, yet it seems to us that as the author has entitled the section thus and so, it would have been better to follow his dictation in the index. These are indeed trifles, yet from a book like this, put forward as a standard text-book, one would like at times to get an instantaneous photograph of the opinion of so competent an authority as von Arlt. Without a double, or even a three-fold, index, such a procedure is quite impossible in one's hasty hours of office practice. Let us hope, then, that in future editions of this, as of all text-books in ophthalmology, or in medicine and surgery, we shall have a superabundant index.

The translation has been accomplished very successfully. We have taken pains here and there to open the original, and then to search for the parallel passage in the English version. Considering the somewhat perverse and obstinate German employed by von Arlt, like the current of a country brook dashing over the stones and logs of involved paragraphs and parentheses, we cannot help congratulating Dr. Ware upon his remarkable and felicitous results at translation and arrangement. How well he has avoided the translator's *bete noir*, that clinging too closely to the text, the great fault of innumerable students who fancy that the original must be reflected unbroken in another language.

Here let us call attention to a minor point—the use of the expression "acuity of vision." Though employed in a large number of text-books, yet the word "acuity" has no place in our language, and ought to be abolished from ophthalmology. For there are a number of expressions equally significant, and even they are quite superfluous. If we say that vision has decreased, to such and such a degree, or that sight amounts to so and so, or that the acuteness of vision is perfect or diminished, or if we simply employ the initial S we have done enough, and have saved ourselves from tautology and the use of that barbarous term "acuity."

Willing as we are to acknowledge von Arlt's ability in the manner in which he has here unfolded his views on the ætiology, pathology, and prognosis of the eye, we must chiefly, and yet briefly and without extravagance, commend him for the broad, catholic, and extra-

ordinarily diversified method of treatment so clearly laid down for so many essentially different types of disease. We cannot help expressing surprise at the fulness of the treatment suggested, for instance, in cases of ulcers and abscesses of the cornea. It seems as if suitable treatment were here offered us for every possible type of corneal ulceration or abscess, so that in any patient's applying sufficientiy early, we ought never to lose an eye. The same may be said concerning the treatment of iritis, in its manilold aspects. We are glad also to notice how much space is given to constitutional treatment, and it is thus very evident that von Arlt, though anti-dating the school of v. Graefe, has never, even in old age, fallen into the glaring, modern, and fashionable error of regarding almost all diseases of the eye, as chiefly local, and demanding nothing but local treatment.

In conclusion we will truthfully, gladly, and honestly declare, that although this text-book is not indispensable to every ophthalmic surgeon, yet we will assert that no one who proposes or offers to treat diseases of the eye can fail to leave its interesting pages, without having learned something entirely new, or, at least, without having refreshed and invigorated his mind with views which are the result of fifty years of experience in one of the world's largest ophthalmic hospitals and cliniques.

Der Elektro-magnet in der Augenheilkunde (The Electro-Magnet in Ophthalmic Surgery). By Prof. Dr. J. HIRSCHBERG, Berlin. (Reviewed by Dr. J. A. SPALDING.)

Professor Hirschberg has given us in this genial and interesting monograph a work which in style and contents rival the recent publications of the celebrated ophthalmic surgeons of Düsseldorf and Vienna, the skilful Mooren and Mauthner. Rarely has it fallen to our lot to peruse so charming and yet so thoroughly scientific and instructive a book. Yet, leaving aside all this well-deserved praise, let us offer for the readers of these ARCHIVES a summary of this lately published book.

Here we have first an historical introduction; then a detailed account of Hirschberg's thirty or more cases; and, finally, a complete review of every case of the removal of iron from the eye with the help of the electro-magnet that has so far been published.

The historical introduction shows us that two hundred and fifty years ago Fabricius attempted to remove iron from the cornea with a magnet, and that one hundred years ago Morgagni and others actually removed bits of iron from corneal abscesses. It is,

however, difficult to prove who thus first removed iron from the *interior of the eye.* Himly (1837) at all events employed the magnet to withdraw iron which, though still resting in the cornea, penetrated into the anterior chamber. Some have awarded, unjustly, the priority to Dixon, of London, but he only used the magnet "to attract the foreign body toward the sclerotic, where it might be more readily grasped with the forceps." McKeown, of Belfast, Ireland, was probably the first to penetrate the vitreous with a magnet, and by this means to remove successfully a piece of iron. The patient's eye exhibited a perforation in the cornea. An incision was made in the sclerotic, and an attempt made to grasp the iron with forceps. As this procedure failed, a magnet was introduced, and the foreign body, weighing 30 *mgr.*, removed. The patient could subsequently read S 2 at 1′. All of McKeown's cases are here given in full detail, but despite their publication in various medical journals (1874 to 1878), no surgeon appears to have immediately followed their suggestions.

During his student years under v. Graefe, Hirschberg never saw a single case of magnetic extraction, and only heard the suggestion laughed at as a dream. v. Hasner, of Prag, however, proposed that forceps and knives should be magnetized for the removal of iron from the lens. In 1875, before he had heard of McKeown's cases, Hirschberg attempted, though unsuccessfully, to remove a bit of iron from the vitreous with the aid of a common horse-shoe magnet. He subsequently experimented on rabbits, and in 1879 made his first successful magnetic extraction in man. Since then he has performed this operation about thirty times, with more perfected instruments. He now uses a magnetic machine made by Doerffel, of Berlin, costing from thirty marks upward, with zinc-carbon elements in a glass jar holding one litre. He renews the fluid from time to time, and always tests the energy of the current previous to the operation. Wires lead to the coil, to the end of which are screwed points of various shapes, which are washed with benzoate of soda or a weak sublimate solution before being passed into the eye. The apparatus will lift a piece of iron weighing five hundred grammes. There is no danger of a bit of iron being repulsed by the point of the magnet, because it happens to be magnetized negatively. There is no need of the enormous machines proposed by Voltolini, for a magnet like Hirschberg's will easily remove any piece of iron that is likely to hit the eye. Besides this, large machines may do more harm than good—

pulling off from the iris, for example, pieces of iron with so much force as to cause traumatic cataract, while with the Doerffel machine the traction is so slow and gentle, yet so certain, that such an accident is impossible.

Voltolini asserts that the click of the foreign body striking the magnet cannot be heard, but Hirschberg declares that he has heard it in a large majority of cases.

The magnets used by other oculists (Snell, Bradford, etc.) are mentioned as of value, while Gruening's permanent magnet is defined as an anachronism. Pooley's method of diagnosticating the *position* of a foreign body in the eye by a hanging magnet is of doubtful utility.

We are next treated to a full description of Hirschberg's thirty-two cases of magnetic extraction of iron from the interior of the eye, from which let us gather all that is valuable as we pass along. One case is interesting on account of the rapid disappearance of hypopyon after removal of iron from the iris. We are also reminded by this case, that by employing the magnet we can often escape excision of the iris, a complication rarely to be avoided when we use mechanical means. In another case of a *minute* piece of iron in the lens, the cataract-knife was magnetized and the offending particle removed. The patient recovered with perfect sight. In cases of *minute* chips of iron in the lens we are advised to try the effect of magnetized instruments, before resorting to the magnetic battery. A similar case was treated unsuccessfully, because after removal of the iron as just suggested the lens was left in position, where it began to swell, and was finally removed, the operation terminating however in total loss of vision.

Comparison of the magnetic extraction of iron from the lens with the old method shows, nevertheless, that the former offers no great advantages over the latter, except that when using the magnet the foreign body never falls into the vitreous. In six cases out of eight by the old method, the visual results were excellent. When the foreign body was large, it was extracted before the removal of the lens; when small, it was grasped with the forceps; when minute or almost invisible, it was removed with the lens. To quote Hirschberg: "I emphasize these results, because I have no desire to praise the new method at the expense of the old."

Section Five treats of the removal of iron from the vitreous, and as this is the most important province of magnetic extraction in ophthalmic surgery, we propose at this point to dwell carefully

upon the indications and suggestions scattered richly about. The path for reaching iron in the vitreous may be made by a meridional section in the sclera, or by a corneal section after extraction of the lens, or after capsulotomy. One of these operations is to be undertaken (*a*) primarily: before irritation has made its appearance, within twenty-four hours after the penetration of a *small* splinter; or (*b*) secondarily: during the stage of irritation, and up to the time when the latter may have increased to circumscribed or even to diffuse suppuration in the vitreous; or (*c*) thirdly: when, after all irritation has ceased, a new inflammation is excited months or years later by a change in the location of the piece of iron. If, on the other hand, *the path to the foreign body is still open, and if, moreover from, it is still* EASILY ACCESSIBLE, the magnet should be introduced along this opening.

A piece of iron is *small* for the vitreous chamber, when it weighs from 25 to 30 *mgr.*, and with such a piece of iron we may obtain perfect success and even at a late date; it is moderately large when it weighs from 50 to 150 *mgr.*, in which case the *primary* operation is alone likely to be successful; it is too large when it weighs from 200 to 500 *mgr.*, in which case the promptest primary extraction cannot restore vision, and *even preservation of the eyeball is doubtful.*

The indications for operating cannot be precisely defined, for all cases are different. But the operation must be done early. If we see a patient in the first stage with a small piece of iron in the vitreous, it is best to operate without delay. If the opening lies in the cornea, and especially near its margin, the scleral section is preferable and offers greater chances of success. If the opening lies in the sclera at a proper distance from the cornea and the foreign body is visible in the coagulum, or can be seen through the cornea, the magnet may be at once introduced, the opening having been reasonably enlarged if necessary. If a scleral section must be made, we should etherize the patient (the pain in removing the foreign body is reported to be very excruciating), and choose a spot rather downward and outward than downward and inward. It is not necessary to divide any muscles (unless a foreign body lies far back in the eye, close to the optic papilla), nor to make any conjunctival flap. The section should be made well behind the ciliary region and in a meridional direction, because we shall thus spare those fibres of the sclera which are essential for the preservation of the shape of the eyeball. If we make an equato-

rial section the eye is subjected to the danger of collapse and total destruction. With a compass we measure off about 8 *mm.* from the lower and outer margin of the cornea, grasp the conjunctiva at this point with a delicate forceps while the assistant rolls the globe upward with strong forceps, then plunge a v. Graefe's knife several *mm.* deep into the vitreous in order to open up a path to the foreign body, and then finish the section by enlarging the incision towards the equator of the eye for a distance of about 6 *mm.* The magnet is then introduced, left inside the eye for a few seconds, and—if our diagnosis is correct—withdrawn with the foreign body attached. The conjunctiva is then sutured over the incision, antiseptic dressings applied, and the operation is finished.

The great difficulty in these cases lies in the diagnosis. If iron has penetrated the cornea, we see the cicatrix in that coat, the rupture in the iris, the incipient opacity in the lens, and the deeper-seated vitreous opacity with perhaps a shiny reflex. If it has passed through the sclera, we see the wound, perhaps a bead of vitreous, perhaps a clot of blood, lying between its lips, or we may see a clot of blood in the vitreous or *bubbles of air.* The chief difficulty of all lies in discovering the position of the missile when it cannot be seen. But even then it must lie within the vitreous chamber after rebounding, or else it is embedded in the retina; Hirschberg never saw one penetrate the eyeball entirely. Hence we must wait until hypopyon appears, or until we gain some satisfactory idea of the position of the foreign body from a circumscribed inflammation of the vitreous, or until the danger of panophthalmitis appears too excessive to be risked.

We ought not to probe the globe with a magnet without proper antiseptic precautions; we may probe more confidently *if the opening lies in the sclera.*

In the second stage we should operate at once.

Occasionally we see patients in the third stage, and a case is recorded in which, despite the presence of iron in the eye for sixteen years and a cataract and well-marked irido-cyclitis, the finest type could at last be read after removal of the iron with the magnet.

When shall we extract iron through a linear or flap section at the margin of the cornea? (*a*) When the patient is young, the foreign body not far behind the lens, the cataract mature, and irritation has ceased; (*b*) when the lens has already been removed, or has been absorbed, and when only a thickened capsule is left behind.

If the foreign body is small and the eye is seen in the first or second stage, and the lens is only partially opaque, the scleral section is preferable ; later, we can extract the lens when mature.

If the eye is ruptured or incised for a distance of 6 to 10 *mm.*, the globe collapsed, or half full of coagulated blood, the magnet performs a genuine surgical triumph in withdrawing a large piece of iron, weighing from 200 to 500 *mgr.* ; but vision is not restored.

The danger of sympathetic ophthalmia is slight after using the magnet.[1] Although enucleation, several times after, proved to be necessary for successful removal of the foreign body, it was only performed in cases in which the eye appeared to be irritated after violent labor. *As a matter of course, enucleation was always done if the iron could not be discovered with the magnet.*

Hirschberg does not believe in neurotomy. Although he has performed over 500 enucleations, he never saw any bad results. A conjunctival suture is always used after this operation.

If the patients are willing to submit to several months of the closest watching, enucleation is not frequently necessary after successful removal of iron with the magnet.

A case is reported in which, despite panophthalmitis, the eye was saved after removal of a piece of iron weighing 31 *mgr.* ; and in another the same result was obtained, after removal of a large piece weighing ONE THOUSAND AND FIFTY *mgr.*

In conclusion, Hirschberg says : " If in the long list of extractions of iron from the vitreous with the magnet which I have performed in the last five years, I have succeeded twice in obtaining excellent vision, once a remnant of vision, and twice in preserving the shape of the globe, the difference in favor of this method, in comparison with the ante-magnetic era, will be more marked when I say, that in the first ten years of my practice I never succeeded a single time in saving a trace of sight when I attempted successfully or unsuccessfully to remove pieces of iron from the vitreous by purely mechanical means."

We have now followed in full detail the indications for the use of the magnet in removing iron from the vitreous. Several times enucleation had to be performed at a later date, several times the attempt at extraction was useless and enucleation was at once performed ; sympathetic ophthalmia was never seen. The results are certainly promising, and the clinical histories so fully given

[1] Unless, as in Aub's case of *two* pieces of iron in the eye, one had been left behind when the other was withdrawn with the magnet.

prove that the magnetic extraction of iron from within the eye opens a new era in ophthalmic surgery.

At the end of his histories, Hirschberg adds a word in favor of the use of protecting-glasses, and urges their universal adoption by workmen exposed to chips of iron, brass, or granite, etc. As an unanswerable argument, he cites the case of a workman who brought to him a piece of iron weighing SIX THOUSAND AND TWENTY *mgr.*, which had simply shattered the protecting-glasses without injuring the eye. And again, he operated for traumatic cataract in an old man, and only obtained S $\frac{1}{3}$, because the cornea was covered with minute scars due to foreign bodies, all of which, as well as the traumatic cataract, might have been avoided by the use of protecting-glasses.

The third chapter of this monograph extends over sixty additional pages, and narrates all the cases of magnetic extraction hitherto published. Into this we will not deeply enter, for we have already occupied much valuable space, yet it will well bear careful perusal for its numberless suggestions in regard to the technique of the operation, and especially in their bearing upon the results of the same. We will, however, call attention to a case observed by Snell, in which *sympathetic ophthalmia developed thirty-two days after enucleation*, and likewise emphasize the excellent results of magnetic extraction obtained by Rheindorf—viz., out of ten cases, the eyeball preserved a normal appearance four times, in four others the external appearance was excellent, in the two remaining enucleation had to be performed. In none, however, was vision restored, but in six or seven at least it had been hopelessly destroyed by the injury.

Finally, let us express the hope that some American publisher will give us this monogragh in an English version, and in some small and easily handled volume, or in the cheap unbound form, as we have it here, with bold, clear type, large handy pages, and proper margins for annotations. Meanwhile we can, and do, heartily commend the German original for its excellent and trustworthy indications for using the magnet in these correctly-called capital cases, and cordially praise the worthy Professor Hirschberg for not exulting too oratorically over the truly remarkable results that he has thus far obtained by his magnetic extraction of dangerous chips and masses of iron from the interior of the eye.

J. A. S.

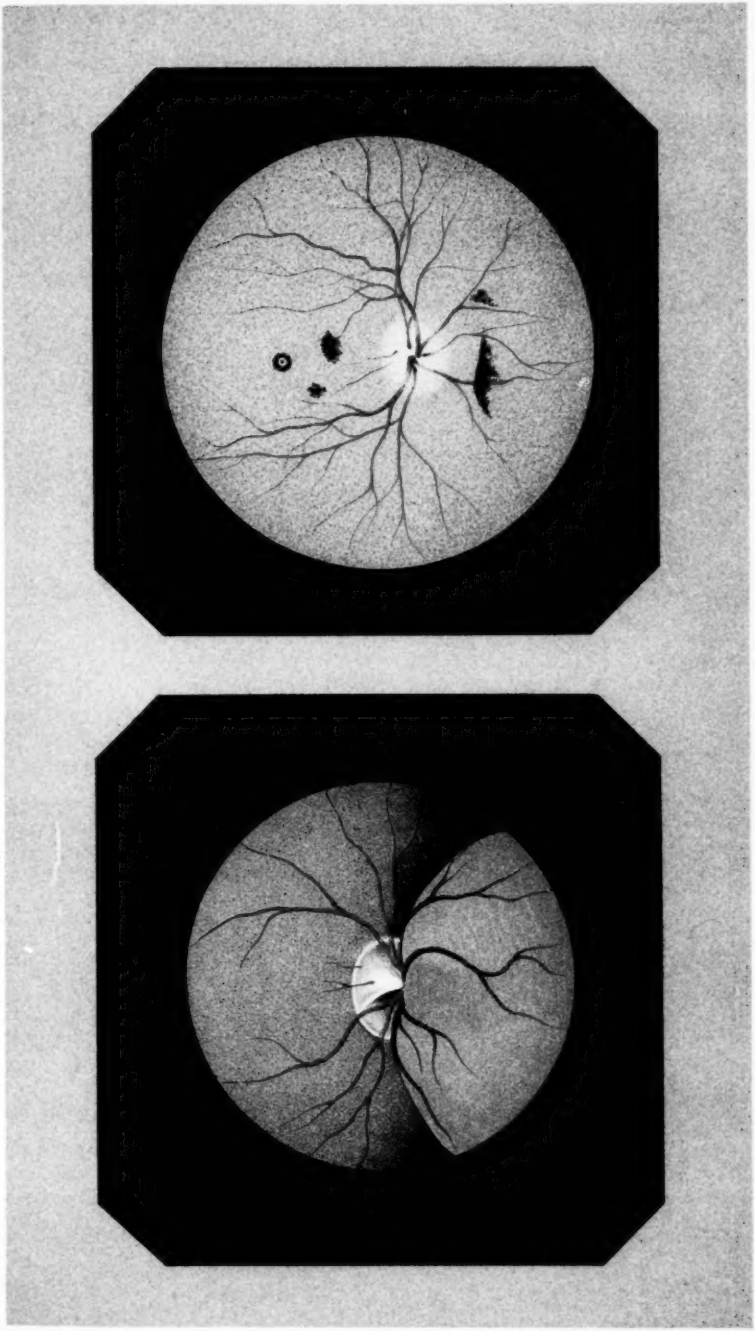
MISCELLANEOUS NOTES.

DR. UHTHOFF has established himself as Lecturer (privatdocent) on Ophthalmology at the University of Berlin.

The Ophthalmological Society meets at Heidelberg from Sept. 14 to Sept. 16, 1885. The members are requested to send the name of their choice for the Graefe medal to the secretary of the society.

The original drawings of JAEGER'S famous "Atlas of the Diseases of the Fundus of the Eye" were recently sold to Professor Norris, in Philadelphia, for 4,500fl. (about $2,000), as reported by the *Med. Ztg.* The enormous amount of labor and care expended upon these drawings can be inferred from the fact that Ed. Jaeger worked on some of them two hundred hours. It is a great pity that such a treasure should go to America, says the above Vienna medical journal.

DR. HIRSCHLER, Professor of Ophthalmology in Budapest, has been appointed by the Hungarian government a member of the Hungarian Upper House (Magnatentafel), in acknowledgment of his excellent character and his eminent, both practical and scientific, merits in his profession. In Austrian papers this honor is mentioned with particular satisfaction, as in former years due recognition and advancement was withheld from Dr. Hirschler because he was a Jew.



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